INTERNATIONAL JOURNAL of IJSETS SPORT, EXERCISE & TRAINING SCIENCES

e-ISSN 2149-8229 **Vol** 7, **Issue** 3, 114–119, (2021) ***Original Article***

http://dergipark.gov.tr/useeabd

The effect of score components on total score in the Group All-Around Ranking of 1st Rhythmic Gymnastics Junior World Championships

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Abstract

Aim: The analysis of the score components that affect the result in rhythmic gymnastics group (RGG) routines can guide the decisions to be made in the future evaluation and competition rules, and the physical preparation of the coaches and athletes. The aim of the study was to determine the effect of total score components on total score in the Group All-Around Ranking-Apparatus Qualification of 1st Rhythmic Gymnastics Junior World Championships (WCh), which was organized for the first time in 2019, Moscow, Russian Federation.

Methods: In this study, 455 components of a total of 65 group routines were analyzed in 5 hoops (33 countries) and 5 ribbons routines (32 countries). Descriptive statistics and linear regression analysis were used for all score components.

Results: In 5 hoops and 5 ribbons routines, the effect of D_{1-2} scores on DTS was 91% and 81%, the effect of D_{3-4} scores on DTS was 99% and 95%, the effect of DTS on TS was 98% and 98% respectively, also in the E score components, the effect of deduction E_{1-2} scores on TS was 93% and 95%, the effect of deduction $E_{3-4-5-6}$ scores on ETS was 88% and 99%, the effect of ETS on TS was 94% and 97% respectively ($p<0.001$). In both routines, the effect of DTS on TS was more than ETS. It was determined that the effects of D_{1-2} and D_{3-4} components on DTS in 5 hoops routines were higher than in 5 ribbons routines and the most effective subcomponent on DTS was D_{3-4}. In the 5 ribbons routines, the effect of ETS was observed to be higher than the 5 hoops routines.

Conclusion: A good balance to be established between the score components is important for the integrity of composition. The predominance of one component can disrupt the beauty of unity.

Keywords

Group routines, Score analysis, Ribbon, Hoop, Composition score, Execution

Article Info

Received:01.09.2021

Accepted:05.10.2021

Online Published:06.10.2021

DOI:10.18826/useeabd.1001903

INTRODUCTION

Rhythmic gymnastics (RG) is a choreographic gymnastics discipline with artistic elements that requires the use of the body and apparatus with musical accompaniment. Competitions are held as individual (RGI) and group (RGG). While the first RGI WCh were held in Budapest in 1963, it became the second official discipline of the RGI International Gymnastics Federation (FIG) in the same year. RGG competitions, on the other hand, took place for the first time in the Olympic Games held in Atlanta in 1996 ("Gymnastics disciplines"). In RGG, two types of competitions are held: the Group All-Around Ranking-Apparatus Qualification and the Group Apparatus Final. Each team / country presents two routines (1 type of apparatus and 2nd apparatus in the junior category) (Federation Internationale De Gymnastique (FIG), 2017) and the five gymnasts presenting the routines work in a team spirit. In the Group All-Around Ranking-Apparatus Qualification, the final scores of each presented exercise are summed up and the top three groups with the highest scores receive an award. Also, In the Group All-Around Ranking-Apparatus Qualification, the first eight successful groups of each exercise in this competition then participate in the Group Apparatus Final. In the final competition, the three groups with the highest points in each series receive an award.

The Code of Points (CoP) is determined by the FIG and is updated every Olympic cycle. For this reason, the CoP is considered a factor as important as it is fundamental to the inner logic of the sport or strategy (the gymnast's possibilities for interaction with space, time, apparatus, compatibility with other gymnasts and criteria of success or failure) when creating competition exercises and training planning (Ávila-Carvalho, Klentrou, & Levre, 2012); Massidda & Calò, 2012; Leandro, Ávila-Carvalho, Sierra-Palmeiro, & Bobo Arce, 2017). The preparation of a group requires a more comprehensive and difficult design than the preparation of an individual gymnast, but it also provides a visual feast for the spectators. It is important for an effective and good composition that the gymnasts in the group have the technique of body and apparatus elements close to each other. A perfect harmony is observed between the movements of the group (simultaneously or in very rapid succession, canon, contrast, all 5 gymnasts together or in subgroups, with a variety of traveling, directions and formations, with possible lifting of one or several gymnasts). The harmony of movement difficulties with music is also extremely important.

RG performances are evaluated according to criteria set by the FIG-RG Technical Committe. Gymnastics is a sport that can be evaluated subjectively, but an extraordinary effort is made both institutionally and individually for an objective evaluation. In RGG, difficulty (D) judges have two subgroups, D1-2 judges evaluate BD (body difficulty) [BD (difficulty without exchanges), ED (difficulty with exchanges), S (dance steps combinations)], and D3-4 judges evaluate AD (apparatus

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difficulty) [R (dynamic elements with rotation), C (collaborations)]. Execution (E) judges have two subgroups, E1-2 judges evaluate artistic faults and E3-4-5-6 evaluate technical faults. The final D-score is calculated as sum of the D1-2 and D3-4, (indicated in the competition results as BD and AD, respectively). The final E-score is calculated as sum of the EA and ET deductions are subtracted from 10.00 points. The total score is determined by adding the D and E scores. If any, line, time, and coordinator judge's deductions can also be applied, and these deductions are subtracted from the gymnast's total score (FIG, 2017). In evaluation, these different judge tasks (perspectives) complement each other for the final score. While the D score consisting of body and apparatus difficulties was at most 10.00 points in 2017, this upper score limit was removed with the updates made in CoP on 1st of February 2018. This encouraged coaches to score higher on the D components. In RGG the length of each exercise is from 2'15" to 2'30". As in RGI, trends towards increasing the score to be obtained per unit time have started in RGG. Although it is important to design and present lasting and memorable compositions in the minds, there have been increases in BD and ED values, especially in the number and values of collaborations.

There have been performance and score analysis studies on individual and group routines in the literature (Ávila-Carvalho et al., 2012a; Leandro et al., 2017; Ávila-Carvalho, Palomero, Klentrou, & Lebre, 2012b; Kutlay, & Yardımcı, 2007; Agopyan, 2014; Örs, 2020; Ávila-Carvalho, Leandro, & Lebre, 2009; Ávila-Carvalho, & Lebre, 2011), but there are fewer studies on group routines (Ávila-Carvalho et al., 2012a; Ávila-Carvalho et al., 2012b). Studies on competition analysis can guide future decisions and preparation of gymnasts. The aim of the study was to determine the effect of total score components on total score in the Group All-Around Ranking-Apparatus Qualification of 1st Rhythmic Gymnastics Junior World Championships.

METHOD

Participants

From 33 countries, 185 elite gymnasts (13, 14 and 15 years old) participated at the Group All-Around Ranking-Apparatus Qualification of 1st RG Junior World Championships (WCh), 2019, Moscow, Russian Federation. 33 countries / groups competed in the 5 hoops routines; 32 countries / groups competed in the 5 ribbons routines (N=65 routines in total). 455 scores of group routines competed were analyzed.

Procedure

The group routines' official competition scores were reached from the results book of 1st RG Junior World Championships (WCh) that are published in the FIG's official web page ("Gymnastics events"). The terms used in the RGG judges' panels were considered in the definitions (D1-2, D3-4, E1-2, E3-4-5-6) of the score components (FIG, 2017). For each routines, (5 Hoops and 5 Ribbons), research data of BD (body difficulty) / D1-2 [BD (difficulty without exchanges), ED (difficulty with exchanges), S (dance steps combinations)] and AD (apparatus difficulty) / D3-4 [R (dynamic elements with rotation), C (collaborations)], difficulty (D); execution artistic (EA / E1-2), execution technic (ET / E3-4-5-6), execution (E); and total scores (TS) of junior group routines were analyzed. For each routine, D1-2 and D3-4 scores are added together and DTS is determined. Execution artistic and execution (E1-2, E3-4-5-6) technic' deduction scores are added up and subtracted from 10.00 points, and ETS is determined. TS is obtained by adding the DTS and ETS scores (FIG, 2017).

Statistical analysis

SPSS 22.0 (SPSS Inc., Chicago, IL) program was used for statistical analysis of the study. For both routines (5 Hoops and 5 Ribbons), the effects of difficulty subgroup scores (D1-2, D3-4) on difficulty total scores (DTS) and execution subgroup deduction scores (E1-2, E3-4-5-6) on execution total scores (ETS) were determined. Likewise, the effects of DTS and ETS on total scores (TS) were determined. Mean ± Standard Deviation, minimum and maximum values were given as descriptive statistics of score compenents. Linear regression analysis was used for these analyses. Significant level was set at $p<0.05$.

RESULTS

The descriptive statistical analysis of the 5 hoops and 5 ribbons routines' score components (DTS, D1-2, D3-4, ETS, E1-2, E3-4-5-6, and TS) are given in Table 1, 2. According to the tables, 5 hoops routines score components' means, maximum and minimum values are higher than ribbon routines scores (E1-2 and E3-4-5-6 excluding deduction points).

Table 1. Descriptive Statistics of the 5 hoops routines.

Score Components n= 33	$\bar{X}$±SS	min value	max value
DTS	12.1 ± 2.80	6.50	18.2
D_{1-2}	4.50 ± 0.75	2.70	6.20
D_{3-4}	7.63 ± 2.14	3.70	12.2
ETS	5.91 ± 1.42	2.58	8.70
E_{1-2} (deduction score)	-1.49 ± 0.63	-2.90	-0.50
$E_{3-4-5-6}$ (deduction score)	-2.52 ± 1.10	-4.53	-1.40
TS	18.0 ± 4.09	9.68	26.9

n; Number of groups, DTS; D total score, D1-2; BD score, D3-4; AD score, ETS; E total score, E1-2; EA deduction score, E3-4-5-6; ET deduction score, TS; total score

Table 2. Descriptive Statistics of the 5 ribbons routines.

Score Components n= 32	$\bar{X}$±SS	min value	max value
DTS	9.66 ± 1.87	6.10	14.1
D_{1-2}	3.84 ± 0.73	2.00	5.90
D_{3-4}	5.82 ± 1.35	3.10	8.50
ETS	5.12 ± 1.55	1.90	8.55
E_{1-2} (deduction score)	-1.38 ± 0.42	-2.10	-0.40
$E_{3-4-5-6}$ (deduction score)	-3.50 ± 1.16	-6.00	-1.05
TS	14.7 ± 3.38	7.60	22.7

n; Number of groups, DTS; D total score, D1-2; BD score, D3-4; AD score, ETS; E total score, E1-2; EA deduction score, E3-4-5-6; ET deduction score, TS; total score.

For the 5 hoops and 5 ribbons routines, the Linear Regression analysis of the score components are shown in Table 3, 4. In Linear Regression analysis, in 5 hoops and 5 ribbons routines, the effect of D1-2 scores on DTS is 91% and 81%. The effect of D3-4 scores on DTS is 99% and 95%. The effect of DTS on TS was 98% and 98% respectively ($p<0.001$).

Table 3. The Linear Regression Analysis of the effect of score components in the 5 hoops routines.

Score Components n= 33			B	t	F	R^2
D_{1-2}	→	DTS	0.91*	12.16	147.89	0.83
D_{3-4}	→	DTS	0.99*	37.51	1407.3	0.98
DTS	→	TS	0.98*	29.89	518.39	0.97
E_{1-2} (deduction score)	→	ETS	0.93*	13.85	191.87	0.86
$E_{3-4-5-6}$ (deduction score)	→	ETS	0.88*	10.12	102.47	0.77
ETS	→	TS	0.94*	15.05	226.63	0.88

n; Number of groups, B; Beta, D1-2; BD score, DTS; D total score, D3-4; AD score, TS; total score, E1-2; EA deduction score, ETS; E total score, E3-4-5-6; ET deduction score, TS; total score. *p<0.001.

Table 4. The Linear Regression analysis of the effect of score components in the 5 ribbons routines.

Score Components n= 32			B	t	F	R^2
D_{1-2}	→	DTS	0.81*	7.58	57.510	0,66
D_{3-4}	→	DTS	0.95*	16.39	268.65	0.90
DTS	→	TS	0.98*	28.80	829.26	0.97
E_{1-2} (deduction score)	→	ETS	0.95*	16.53	273.28	0.90
$E_{3-4-5-6}$ (deduction score)	→	ETS	0.99*	47.87	2291.1	0.99
ETS	→	TS	0.97*	23.24	540,.22	0.95

n; Number of groups, B; Beta, D1-2; BD score, DTS; D total score, D3-4; AD score, TS; total score, E1-2; EA deduction score, ETS; E total score, E3-4-5-6; ET deduction score, TS; total score. *p<0.001.

DISCUSSION

RG skills are very complex. Although they include techniques of body movements and apparatus, they are also including fitness, graceful and artistic presentation. Most of the skills necessary for successful competitive compositions take a gymnast a long time to learn and master (Jastrjembskaia, & Titov, 1999). The creation of choreographies of RG, which is a multi-component sports branch, also requires extreme diligence. The analysis of the competition results (subgroup scores that make up the result score) can guide the future decisions and the preparations of the athletes. The popularity of RGG competitions is gradually increasing and it is thought that this analysis study, which is based on the results of the WCh organized for the first time in the junior category, will contribute to the literature.

Especially in the last three Olympic cycles, FIG has made many changes to the CoP to encourage the development of the sports branch ("Gymnastics rules"). To understand the competitive model and performance in the RG, several studies have analyzed the composition of both individual and group competition routines (Ávila-Carvalho et al., 2012a; Ávila-Carvalho et al., 2012b, Kutlay, & Yardımcı, 2007; Agopyan, 2014; Örs, 2020; Ávila-Carvalho et al., 2009; Ávila-Carvalho, & Lebre, 2011, Trifunov, & Slovodanka, 2013). Leandro et al. (2015) point out that the updates to the code of points are directed toward increasing the complexity of the interaction between the gymnast and the apparatus in the routines, either through an increase in a number of elements or the degree of coordination difficulty (Leandro, Ávila-Carvalho, Sierra-Palmeiro, & Bobo Arce, 2015). In addition, changes to the CoP significantly affect the performance of gymnasts who need to change their training and learn possible new technical elements (Sierra-Palmeiro, Bobo-Arce, Pérez-Ferreirós, & Fernández-Villarino, 2019). Creative new movements and new connections also make a dynamic contribution to the development of this sport.

According to the descriptive statistics of this study, 5 hoops routines score components' means, maximum and minimum values were higher than ribbon routines scores (E1-2 and E3-4-5-6 excluding deduction points) (Table 1, 2). The characteristics of the specific apparatus might affect the number of possible ways for the gymnasts to interact with the apparatus (Leandro et al., 2015). In RG, apparatuses are divided into two as rigid (hoop, ball, and clubs), and soft (ribbon and rope) in terms of their structural features (Jastrejevskaya, 1995). The length of the ribbon device for the junior category is 5 meters. The shapes drawn

by the ribbon in space should be clear when performing movement difficulties. If this is not achieved, execution deductions are made, and even the body difficulties made at the same time in major execution mistakes are not counted. Because to be considered a body difficulty, the apparatus must be used with fundamental and non-fundemental technical movements and with the desired features (RG-CoP). Therefore, there is a high probability of mistakes in the technical use of the ribbon. The ribbon apparatus may be more difficult to control than the hoop apparatus while performing the required difficulties and the designed composition. The major change in the basic technique of the apparatus (0.30 or more technical errors) and each incorrect body position (with a 0.50 technical execution penalty) adversely affect the DTS. These difficulties increase even more when there are five gymnasts in the competition at the same time. The reasons mentioned may explain the lower DTS, ETS and TS means in ribbon routines.

In general, in the official competition results, there are BD (unchanged), ED, and S in the scores indicated as BD, and R and C in the scores indicated as AD. In each group routine in the junior category, a minimum of 3 BD (unchanged), a minimum of 3 ED, a minimum of 2 S is required for the D1-2 score; a maximum of 1 R and a minimum of 4 C are required for the D3-4 score. There is a limit in R, but groups can perform more than 4 C (FIG, 2017). Although the score components are different from each other in perspective, they have internal dynamics that affect each other. Eg. dance step combination is one of the components emphasizing the artistic value of the routines, where the gymnasts reveal their style.

In Linear Regression analysis, in 5 hoops and 5 ribbons routines, the effect of D1-2 scores on DTS was 91% and 81%, the effect of D3-4 scores on DTS was 99% and 95%, the effect of DTS on TS was 98% and 98% respectively in this study ($p<0.001$) (Table 3, 4). In line with the results, the effect of D1-2 and D3-4 components on DTS was higher in the 5 hoops routines than in the 5 ribbons routines. It was determined that D3-4 had a high effect on DTS in the 5 hoops routines compared to D1-2 ($p<0.001$) (Table 3, 4). It is thought that the high effect of D3-4 on the total score may be due to the increase in the number of C. The tendency to increase the number of C in routines can increase the score that can be obtained per unit time by affecting both the DTS and the TS. However, the effect of DTS on TS was similar in both apparatus (5 hoops and 5 ribbons) routines. This shows that gymnasts can perform apparatus and body difficulties much better in 5 hoops routines. The structural features of the ribbon apparatus and the difficulties of using it in routines have been mentioned before. These reasons show why it can affect DTS less in 5 ribbon routines. Ávila-Carvalho and Lebre (2011) showed that routines evolved to increase the difficulty and variety in body movements, to a higher technical mastery and enrichment in the use of apparatus. The number of technical movements has increased for all apparatus. This also shows that the effect of apparatus skills on the final score and the coordination between apparatus use and body are increased (Tsopani, Dallas, Tasika, & Tinto, 2012). Our study results seem to be compatible with this information in this literature.

In RGG, body and apparatus elements are tried to perform with aesthetic and technical perfection. All deviations from correct performance are considered EA or ET faults. In EA, unity of composition-music and movement (guiding idea: character, connections, rhythm, dynamic changes), body expression and variety (formations, exchanges, organization of the collective work, directions and travelling, apparatus elements) are evaluated (FIG, 2017). In our study, in 5 hoops and 5 ribbons routines, the effect of E1-2 deduction scores on ETS was 93% and 95%, the effect of E3-4-5-6 deduction scores on ETS was 88% and 99%, the effect of ETS on TS was 94% and 97% respectively ($p<0.001$) (Table 3, 4). Fewer technical mistakes can generally have a positive impact on the EA score. In addition, E3-4-5-6 scores are also significantly affected by the mistakes of the gymnasts (eg. basic technique of body and apparatus, synchronization, formations, collision, loss of apparatus, crossing of the boundary of the floor area by the apparatus or one or two feet or by any part of the body or any apparatus leaving the floor area, trajectory, all body and apparatus deviations, etc.) (FIG, 2017). The difficulty of using the ribbon apparatus can bring technical and artistic faults. In our study, it was observed that the effect of the E1-2 and E3-4-5-6 components of the 5 Ribbons routines on ETS was higher than the 5 hoops routines.

There may sometimes be differences between the scores of a gymnast or group with more variety (with more risk of making mistakes), with good technique, and the scores of a group with less variety and good technique. More clear interpretations can be made by increasing the number of studies examining the causes of the effects. The difficulty levels of elite gymnasts are close to each other. It may be the artistic components of the routines that distinguish the routines from each other and determine the level. Eg. in the final competitions, it is seen that the levels of the eight groups are close to each other, but the ranking is determined by the difference in the execution points. In body and apparatus movements, technique, mastery, use of music, impressiveness, creativity, and perfection affect the execution scores. Although there were no big differences in the effects of some score components in this study, these effects may increase or decrease depending on the nature of the competitions or the level of the gymnasts.

In RG, all kinematic, dynamic, and rhythmical characteristics of exercise (spatical, time, spatial temporal) technique and elements of body movements are emphasized (Jastrejevskaya, 1995). The ability to make a good artistic impression is one of the important attributes a gymnast must acquire. Perfect aesthetics colors compositions with emotion, making them expressive. How closely related are aesthetics to technical mastery? It is possible for the gymnast who possesses a lower degree of technical mastery to make a good artistic impression or vice versa. Certainly, aesthetics depends on technical mastery (Jastrjembskaia, & Titov, 1999). The main reason for the success in the RG competition is the capacity to perform the series with high-level body elements and apparatus technique, perfect execution, in accordance with the character and rhythm of the music, adhering to the principle of originality and variety (Leandro, Ávila-Carvalho, Sierra-Palmeiro, & Bobo Arce, 2016). Ferreirinha, Carvalho, CôrteReal, & Silva (2011) states that it is important to know the features of the competition routines and the details about the specificity of their components to determine the training models.

The values of the movements can be increased with additional criteria (eg. without hands or out of the visual) in ED, R, and C in RGG routines. However, these possibilities may be more in C. In this regard, analysis studies of C values (the values of each C formed by the criteria) and numbers are also needed. In addition, the analysis of the relationship between the intensity of routines and the ETS and its components can be investigated in the future and contribute to the literature.

For different and expressive compositions, coaches, choreographers, and gymnasts tend to find new body and apparatus difficulties and movement connections. These searches for creativity and variety may also create some changes in the rules and this situation provides a dynamic contribution to the development of RGG.

In this study, only one competition score analysis was made. The score components and performance analyzes to be made in the competitions in which many gymnasts and groups participate (every World and European Championships) can make important contributions to the decisions to be taken and guide the preparations of the athletes and coaches.

CONCLUSION

As a result, in both routines, the effect of DTS on TS was more than ETS. It was determined that the effects of D1-2 and D3-4 components on DTS in 5 hoops routines were higher than in 5 ribbons routines and the most effective subcomponent on DTS was D3-4. In the 5 ribbons routines, the effect of ETS was observed to be higher than the 5 hoops routines. Each score component is important for a good performance. The dominance of one component can disrupt the beauty of integrity.

PRACTICAL APPLICATION

It is thought that the balance to be established between the score components that determine the total score can contribute to the integrity of the composition.

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CITATION OF THIS ARTICLE

Kutlay, E., Tatlıbal, P. & Oral, O. (2021). The effect of score components on total score in the Group All-Around Ranking of 1st Rhythmic Gymnastics Junior World Championships. *International Journal of Sport, Exercise & Training Sciences - IJSETS*, 7(3), 114–119. Doi: 10.18826/useeabd.1001903