WOMEN'S ARTISTIC GYMNASTICS ROUTINE COMPOSITION AT RIO 2016 OLYMPIC GAMES: A TECHNICAL ANALYSIS OF BALANCE BEAM AND FLOOR EXERCISE ROUTINES

Mateus Henrique de Oliveira[1], Leticia Bartholomeu de Queiroz Lima[2] and Andrize Ramires Costa[3]

[1] School of Physical Education, UNICAMP; Brasil
[2] Univerity Center Hermínio Ometto – UNIARARAS; Brasil
[3] Federal University of Pelotas, UFPel, Brasil

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Abstract

Artistic gymnastics is a sport comprising a variety of movements performed on apparatus, connected by the art of movement. The Code of Points is a document that brings together all the rules of this sport; it guides the work of coaches and gymnasts, helping to compose the routines presented in competitions. This study focuses on women's artistic gymnastics and the implementation of its rules, established by the Code of Points 2013-2016. It aims to analyze the elements that composed the gymnasts' routines during the last Olympic Games (Rio 2016) and identify the possible technical relations between the composition of the balance beam and the floor exercises in line with the current Code. For this purpose, we carried out a video analysis of 82 balance beam routines and 82 floor exercise routines, in total 164 routines performed by athletes competing in women's artistic gymnastics at the Rio 2016 Olympic Games qualifying competition. We observed that the Code of Points is still little explored, and gymnasts use only a few of the elements available. In this sense, the International Gymnastics Federation and, more specifically, the Code of Points, which regulates the sport, should devise strategies for better usage of the elements available within the stipulated rules.

Keyswords: *Routine composition, Code of Points, Olympic Games.*

INTRODUCTION

Artistic gymnastics (AG) is a sport formed by a variety of movements performed on apparatus with different motor requirements, and according to Arkhaev & Suchlin (2004, p.11), "gymnastics is connected by the art of movement". In this modality, the judges' judgment is based on the perfect execution of the movements that require substantial daily training. Also, Nunomura *et al.* (2009) points out that, like other sports, AG is characterized by complex and daring exercises, and gymnasts constantly challenge laws of physics, trying to reach and exceed their bodies' and apparatus' limits while executing increasingly audacious and complex movements.

AG requires that gymnasts demonstrate neuromuscular control, rhythmic sense, complete body balance control, and a technical posture for performing its elements. Besides, gymnasts have to demonstrate security and confidence through different exercises with

different degrees of difficulty that need to be executed in a harmonious and precise manner. Aesthetics and art, associated with performance, give AG its artistic quality, also found in other artistic manifestations (Sarsfield, 1959). In the last decade, we have seen a notable evolution and modification in AG's competitive methods.

In AG, gymnast's results are the sum of two scores, the difficulty and the execution score, awarded for each apparatus and in comparison with other competitors. The Code of Points (CoP) is a document that defines the AG rules. It is considered the single most important instrument that influences the development of AG. Pastor *et al.* (2003) refers to the CoP as the main regulator of coaches', judges', and gymnasts' work.

Thus, the CoP defines the parameters and criteria to differentiate gymnasts' executions, the scoring attributions and judging methods; as such, it functions as the parameter for score elaboration by judges (judgment), and routines composition and training guidance by coaches (Robin & Santos, 2014). These arguments are supported by the changes made to the CoP updated every four years. According to Arkaev & Suchilin (2004), the changes made to the CoP havr not always been the most adequate; nevertheless, most of them have been quite positive and beneficial for the development of the sport and at the same time have guided the development of the modality as we know today.

In women's artistic gymnastics (WAG), four apparatus are officially recognized by the International Gymnastics Federation (FIG): the vault, the uneven bars, the balance beam and the floor exercise. However, gymnasts are expected to include acrobatic and dance elements in their routines only on the balance beam (BB) and the floor (FX) apparatus (FIG, 2017; Donti *et al.*, 2014). These elements are combined to maximize their performance and increase the final score, as specific to each apparatus.

On the balance beam, every routine begins with a mount (taken off from the board or the mat); during the routine gymnasts perform leaps, jumps and hops, turns, holds and acrobatic elements with or without flight phase and hand support. The evaluation of the routine begins with a mount and finishes with landing a dismount. After finishing the routine, whether with a dismount or with a fall that lasted more than 10 seconds, judges award two scores: difficulty value (DV) score and execution value (EV) score. The DV score is calculated as the sum of maximum 8 highest difficulties including the dismount (maximum 5 acrobatic and minimum 3 dance elements), the prescribed composition requirements (CR) (Table 1), and the values that gymnasts get for directly connecting acrobatic elements, turns and/or acrobatic-dance elements. The EV score is given for the quality of the skills performed and the gymnast's artistic performance (FIG, 2013), and has an initial value of 10.00 points if the gymnast performs at least 7 elements. From the value of 10.00 points judges deduct errors that occur during the performance of a routine. The final score (FS) is calculated as the sum of DV and EV minus neutral deductions.

Just as on the BB, the DV and EV scores for the floor exercise are calculated in the same way. On this apparatus, the gymnast performs leaps, jumps, hops, turns, hand support elements and saltos in different directions (forward, sideward and backward). The FX is the only WAG apparatus that has musical accompaniment, which is of major importance for the development of the routine. The gymnast will be evaluated from her first movement, which does not necessarily have to be at the beginning of the music but must end exactly at the end of the music. During this Olympiad, the artistic aspects for this apparatus have been significantly changed, including providing a different understanding and bringing forward a great discussion about what should be evaluated

in terms of choreographic composition, expression, music and musicality (Donti *et al.*, 2014; Kerr & Obel, 2015).

Acrobatic and dance elements have different scores and possible combinations between them, and, together with the execution of each element, they make up the gymnast's final score at competitions. Therefore, the evaluation of competitive WAG is based on the quantitative and the qualitative index, with technical rigor in the execution of acrobatic and dance movements and valorization of expressiveness and creativity in the choreography (FIG, 2015; Donti *et al.*, 2014). Sterkowicz-Przybcién (2004, p. 49) presents a model for the composition and fundamental elements of BB and FX routines in accordance with the CoP definitions :

The balance beam routine may not exceed 90 seconds and must include acrobatic (tumbles, balance holds, handsprings, saltos) and dance (steps, jumps, skip jumps, rotations, body waves, balance holds) elements. The balance beam is very characteristic of women's gymnastics and the routines must emphasize femininity, grace, diversity of movements, harmony between acrobatic and dance elements, presentation and artistry. Balance beam requires accurate movements, intensive concentration and perfect balance. Any lack of these means a point deduction. A serious mistake is getting hold of the apparatus to avoid a fall. The floor exercise routine, like balance beam, may not exceed 90 seconds. This event is a combination of acrobatic and dance movements choreographed to music. The important elements are harmony of acrobatic and dance movements, integration between the movements and music, grace, rhythm, presentation and artistry. The gymnasts must make versatile use of the entire floor space, changing the pace and direction of performed elements.

Another factor that should directly influence the routine composition and configuration is the setup of the routines according to each apparatus's specific requirements, called "Compositional Requirements" (Kalinski *et al.*, 2011; Donti *et al.*, 2014). Gymnasts who perform elements that meet these requirements are awarded a bonus of 0.5 points in their final difficulty score. This means that gymnasts tend to include some elements in their routines only to meet these requirements and not necessarily to count toward the eight elements that make up the calculation of the difficulty[1] score, thus increasing the maximum possible score to be achieved (FIG, 2013). The Compositional Requirements stipulated by the CoP 2013-2016 for both apparatus are shown in Table 1.

Thus, in order to deepen the theme and assist coaches, judges, technical committees and subsequent scientific works, we analyzed the elements that made up the routines of WAG gymnasts as they were presented at the Olympic Games (Rio 2016), and to identify possible technical relations between the composition of the BB and the FX routines, according to the CoP used during the 2013-2016 Olympiad (FIG, 2013). The purpose of this study is to identify possible patterns of routine composition to provide better guidance for the modality, both for the evolution of the CoP and better work of those involved with the practice (coaches, judges, athletes and sports managers).

METHODS

This study has a quantitative exploratory design developed through the videographic research technique (Penafria, 2009). The videographic research was carried out between October and

[1] According to CoP (2013-2016) for the composition of the difficulty value of Balance Beam and Floor Exercise routines, the eight most valuable elements performed by the gymnasts are counted, with a maximum of five acrobatic elements and a minimum of three dance elements (FIG, 2015).

November 2019, analyzing the images generated by the French broadcasting channel "FranceTV Sports®" through their official account on the online video platform YouTube®.

We analyzed 164 routines, 82 on BB and 82 on FX, from WAG gymnasts competing at the Rio 2016 Olympic Games qualifying competition. We analyzed all female gymnasts from all countries who passed through on these two apparatus. Qualified and up-to-date national and international judges carried out the video analysis.

The video analysis was performed in two steps:

1. The videos were analyzed separately to identify each of the acrobatic and dance elements that composed the routines. After identification, the difficulty value for each element was checked in the Table of Elements of the CoP (2013-2016);

2. Acrobatic, dance, and mixed connections[2] were analyzed. Also, falls and neutral deductions[3] were noted in each routine. The analyzed elements were quantified according to the gymnasts' skills (acrobatic, dance, connection, etc.), as described in the CoP in force at the time of the competition (2013-2016).

The data obtained through the videographic analysis were organized and accounted for according to the type of element (acrobatic or dance), connection (acrobatic, dance or mixed), neutral deductions and falls. In total, 1883 gymnastic elements were analyzed (between acrobatic and dance) in 164 routines, 82 on BB and 82 on FX. For the data analysis, we used the categorization methods for different types of elements according to the CoP division, in addition to descriptive statistics, using mean and mode values of the elements in the routines.

For this research, we considered only the elements with some difficulty value, while other elements performed were considered choreographic elements. From this analysis, we compared the routines' elements on the same apparatus to the descriptions available in the CoP according to their group elements, and also a general analysis between the BB and the FX apparatus, comparing the total amount and type of movements per routine, and reflecting on the composition of the routines on each apparatus.

In the analyses of the FX apparatus, the handspring forward, the round-off and the flic-flac elements were not considered since such movements were not included in the DV as they are preparatory elements for the acrobatic elements of higher value. On the BB, however, these elements in some cases were included in the DV and they feature in the movements for the CR (Table 1) complements and CV bonus. Elements performed more than once were counted in their entirety, although their second execution is not counted toward the DV.

RESULTS

The following results were divided into tables according to different forms of quantification and typification of the elements presented by the gymnasts. The total sum of different types of elements (acrobatic and dance), connections of elements (acrobatic, dance and mixed), number of falls and neutral deductions, as well as the incidence of each of the elements, its respective group and its respective value are presented in the Table

[2] The connections, whether acrobatic (only with acrobatic elements), dance (only with dance elements), or mixed (with acrobatic and dance elements), are characterized by gymnastic elements that are directly or indirectly performed subsequently within the same sequence/passage and can be used either to fulfill the composition requirements of an apparatus or to gain a bonus in the difficulty score.

[3] These are deductions related to specific problems during the gymnast's performance, such as exceeding the time limit of the routines, stepping outside the defined areas of the apparatus, or not presenting properly to the judges' panel.

of Elements. Finally, a list of how many elements from each of the groups were performed during the CI stage of the competition are presented in Table 5.

Table 1
Composition Requirements defined by FIG for Balance Beam and Floor Exercise.

Balance Beam	Floor exercise
● One connection at least 2 different dance elements, 1 being a leap or a jump with 180º split (cross or side), or straddle position; ● Turn (May be from Group 3); ● One acrobatic series, min. of 2 flight elements (with or without hand support), 1 being a salto (elements may be the same); ● Acrobatic elements in different directions (fwd/swd and bwd); ● Acrobatic dismount with the minimum value of D.	● A dance passage composed of two different leaps or hops, (from the Code) connected directly or indirectly (with running steps, small leaps, hops, chassé, chainé turns), one of them with 190º cross/side split or straddle position; ● Salto with longitudinal axis turn (min. 360º); ● Salto with double breadth axis; ● Salto bwd and salto fwd in the same or different acrobatic line; ● Acrobatic dismount with the minimum value of D

Table 2
Quantity and type of elements performed in the qualifiers of BB and FX at the 2016 Olympic Games.

Qualification – Balance Beam		Qualification – Floor Exercise	
Acrobatic elements	583	Acrobatic elements	391
Dance elements	476	Dance elements	433
Total elements (acrobatic + dance)	1059	Total elements (acrobatic + dance)	824
Acrobatic connections	147	Acrobatic connections	71
Dance connections	102	Dance connections	112
Mixed connections	90	Mixed connections	10
Falls	12	Falls	12
Neutral deductions for exceeding the routine's time	6	Neutral deductions for going out of bounds	17

Table 3
Incidence of elements in Balance Beam.

Gymnastics leaps, jumps and hops	Gymnastics turns	Acrobatic flight elements	Acrobatic Dismounts
Switch leap with ½ turn (D) – 48	2/1 turn on one leg with free leg optional below horizontal (D) – 13	Salto bwd stretched step-out (C) – 41	Salto bwd stretched with 2/1 twists (C) – 2
Switch ring leap (E) – 22	2/1 turn in tuck stand on one leg (D) – 2	Salto fwd tucked (D) – 33	Salto bwd stretched with 2 ½ twists (D) – 9
Johnson leap (C) – 15	2 ½ turn in tuck stand on one leg (E) – 2	Free aerial round-off tucked (E) – 1	Double salto bwd piked (E) – 32
Switch leap (C) – 62	2/1 turn with heel of free leg fwd at horizontal throughout turn (E) – 1	Salto bwd tucked (C) – 22	Double salto bwd tucked (D) – 11
Straddle pike jump (A) – 9	1/1 turn with heel of free leg fwd at horizontal throughout turn (C) – 14	Salto bwd tucked with 1/1 twist (F) – 7	Arabian double salto fwd tucked (G) – 1
Sheep Jump (D) – 25	1/1 turn with free leg held upward in 180º Split position throughout turn (C) – 11	Salto fwd piked (E) – 12	Salto bwd stretched with 1 ½ twists (C) – 1
Split leap with 1/1 turn (D) – 3	1/1 turn on one leg with free leg optional below horizontal (A) – 47	Salto bwd piked (C) – 7	Salto fwd stretched with 1/1 twist (B) – 1
Split jump (A) – 68	1/1 Illusion turn (D) – 2	Salto bwd stretched with legs together (E) – 28	Gainer salto piked at the end of the beam (C) – 1
Stretched jump/hop with 1/1 turn (B) – 1	3/1 turn on one leg with free leg optional below horizontal (E) – 1	Salto bwd stretched with 1/1 twist (G) – 1	Gainer salto stretched at the end of the beam (D) – 10
Wolf hop/jump (A) – 53		Free Aerial Cartwheel (D) – 56	Gainer salto stretched with 1/1 twists at the end of the beam (E) – 5
Wolf hop/jump with 1/1 turn (C) – 3		Free aerial walkover (D) – 60	Salto bwd stretched with 3/1 twists (F) – 6
Split leap fwd (A) – 41		Salto swd tucked to side stand (D) – 39	Double salto bwd tucked with 1/1 twist (G) – 1
Sissone (A) – 8		Salto swd tucked with ½ turn to side stand (E) – 1	
		Flic-Flac with ½ turn (D) – 8	
		Flic-flac with 1/1 twist (D) – 3	
		Flic-flac with min. ¾ twist before hand support (D) – 2	
		Arabian salto tucked (F) – 2	
		Flic-flac (B) – 82	
		Flic-flac with high flight phase and swing down to cross straddle sit (B) – 1	
		Round-off (B) – 61	

Legend: fwd: forward; bwd: backward; swd: sideward.

Table 4
Incidence of elements in Floor Exercise.

Gymnastics leaps, jumps and hops	Gymnastics turns	Saltos forward and sideward	Saltos backward
Switch leap with ½ turn (C) – 35	2/1 turn in tuck stand on one leg (D) – 6	Salto fwd stretched with 2/1 twists (D) – 4	Salto bwd stretched with 2 ½ twists (D) – 37
Switch ring leap with ½ turn (D) – 2	2/1 turn with heel or free leg fwd at horizontal throughout turn (D) – 19	Double salto fwd tucked (F) – 2	Salto bwd stretched with 2/1 twists (C) – 11
Switch ring leap (C) – 35	2/1 turn with free leg held upward in 180º Split position throughout turn (D) – 24	Arabian double salto fwd piked (F) – 3	Double salto bwd piked (D) – 48
Switch leap with 1/1 turn (D) – 30	2/1 turn on one leg with free leg below horizontal (B) – 30	Arabian double salto fwd tucked (E) – 8	Double salto bwd tucked with 2/1 twists (H) – 10
Johnson leap (B) – 6	1/1 turn in tuck stand on one leg (B) – 1	Aerial Cartwheel (A) – 15	Double salto bwd stretched with legs together (F) – 23
Johnson leap with ½ turn (C) – 14	1/1 turn with heel or free leg fwd at horizontal throughout turn (B) – 4	Salto fwd piked (A) - 3	Double salto bwd stretched with ½ turn (F) – 1
Switch leap (B) – 15	1/1 turn with free leg held upward in 180º Split position throughout turn (B) – 10	Salto fwd piked with ½ turn (B) – 3	Double salto bwd tucked (D) – 53
Split leap to ring position with 1/1 turn (D) – 7	2/1 turn on one leg with free leg below horizontal – 20	Salto fwd stretched with legs together (B) - 6	Whip back (A) – 12
Split leap with 1/1 turn (C) – 43	1/1 Illusion turn (B) – 4	Salto fwd stretched with ½ turn (B) – 3	Salto bwd stretched with legs together (A) - 1
Split leap with 1 ½ turn (D) – 26	4/1 turn on one leg with free leg below horizontal (E) – 2	Salto fwd tucked (A) – 8	Salto bwd tucked (A) – 1
Split ring leap (C) – 13	2/1 turn in back attitude (D) – 2	Salto swd tucked or piked (A) – 4	Salto bwd stretched with 1 ½ twists (C) – 25
Split leap fwd (A) – 15	3/1 turn on one leg with free leg below horizontal (C) – 14	Salto fwd stretched with 1 ½ twists (C) – 3	Salto bwd stretched with 3/1 twists (E) – 17
Split leap fwd with 1/1 turn (C) – 16	3/1 turn with free leg held upward in 180º Split position throughout turn (E) – 1	Salto fwd tucked with 1/1 twist (B) – 1	Salto bwd stretched with 3 ½ twists (A) - 2
Wolf jump (A) – 2		Salto fwd stretched with 1/1 twist (C) – 11	Double salto bwd piked with 1/1 twist (E) – 7
Wolf jump with 1/1 turn (B) – 1		Aerial walkover (A) – 16	Double salto bwd stretched with 1/1 twist (H) – 6
Straddle pike jump with 1/1 turn (C) – 26			Double salto bwd tucked with 1/1 twist (E) – 22
Stag jump (A) – 10			

Legend: fwd: forward; bwd: backward; swd: sideward.

Table 5
Quantification of the types of exercises present in the apparatus.

Balance Beam			Floor Exercise		
Type of exercise	N˚ of exercises in the CoP	N˚ of exercises performed	Type of exercise	N˚ of exercises in the CoP	N˚ of exercises performed
Gymnastics Turns	22	9 (41%)	Gymnastics Turns	19	13 (68,5%)
Gymnastics Leaps, Jumps and Hops	35	13 (37%)	Gymnastics Leaps, Jumps and Hops	39	17 (43,5%)
Acrobatic Flight	36	21 (58%)	Saltos Forward and Sideward	16	14 (87,5%)
Dismounts	29	12 (41%)	Saltos Backward	19	15 (79%)

DISCUSSION

The first information from this data was the average of exercises performed by gymnasts on each apparatus (Table 2). The average was calculated by summing all performed elements on each apparatus (1059 elements on BB and 824 elements on FX), then dividing them by the number of routines performed on each apparatus in the competition analyzed individually (82 on each). Thus, we have an average of 12.91 elements per routine on BB and 10.04 on FX. The average number of elements has been increasing over the years, despite the time limit for the routines, as shown in the study by Seeman-Sinn *et al.* (2021), Kalinski *et al.* (2021) and Kezic *et al.* (2021); this has been directly influenced by the changes and adaptations of the CoP for each edition of the Games.

Considering that both BB and FX have the same total execution time - 1 minute and 30 seconds - we can infer that the FX, due to its lower average of elements compared to the BB, presents a greater concern in terms of the time devoted to the choreographic execution of the routine. This can probably be justified by the greater space to be covered and occupied on the FX platform (a 12 x 12-meter square) compared to the BB (5 meters long and only 10 centimeters wide), allowing greater freedom of movement in terms of dimension and a greater need for passages and choreographic elements in FX.

Also, the FX musical accompaniment seems to influence the smaller number of elements compared to the BB, given that the gymnast's movement needs to accompany the music throughout the performance. For such a difference between these apparatuses to be adequately evaluated, there are evaluation criteria such as Music and Musicality, for example, included in the FX execution score (Kezic *et al.*, 2021). Gymnasts can be appropriately judged for their artistic presentation using those criteria, although some recent studies have pointed out the difficulty of understanding and applying the concept of the artistic component that some coaches and judges have (Pajek *et al.*, 2013; 2014; Pajek, 2015).

In addition, a frequency analysis of acrobatic and dance elements in the routines was also carried out (Tables 3 and 4). For this analysis, 82 routines on both apparatus were considered. According to the CoP Table of Elements (FIG, 2013) divisions, the elements were grouped into 4 groups. Each element can be performed only once for the routine's difficulty count (Tables 2, 3 and 4), but elements can be performed more than once to create acrobatic, dance and mixed connections and the sum is added to the connection values, but not to the total element count.

On BB (Table 3), the elements in each group that most frequently appeared were the "split jump" (gymnastics leap - present in 83% of all routines), "1/1 turn on one leg with free leg optional below horizontal " (gymnastics turn - present in 57% of all routines), "flic-flac" (acrobatic elements - present in 100% of the routines), and the "double salto bwd piked" (acrobatic dismount - present in 39% of the routines).

On FX (Table 4), the elements in each group that most frequently appeared were the "split leap with 1/1 turn" (gymnastics leap - appears in 52.5% of all routines), "2/1 turn with free leg held upward in 180º split position throughout turn " (gymnastics turn - appears in 29% of all routines), "aerial walkover" (forward / side acrobatics - appears in 19.5% of all routines) and "double salto bwd tucked" (backward acrobatics - appears in 64.5% of all routines).

There is a greater variability of different types of leaps, jumps, hops, turns, and acrobatic elements on the FX apparatus (Table 5). It demonstrates greater versatility not only in the composition of the routines but also in terms of teaching and learning new elements throughout the gymnast's lifespan in the sport, given its development phases and important physical and psychological variables that AG involves (Nunomura *et al.*, 2010; Kalinski *et al.*, 2011).

Thus, it is clear that the composition of routines has a greater focus on competitive performance since the elements chosen and developed throughout gymnasts' sports career have a development line focused on the final difficulty and execution scores calculation (Cuk & Forbes, 2010), and the choreographic aspects take a secondary role. Erceg *et al.* (2014), Nunomura *et al.* (2019) and Atikovic & Kamenjasevic (2021) claim that practice time, experience in the sport and going through different configurations of structuring a routine according to the CoP in different Olympiads favor the development of complex variation of gymnastics skills in search of higher values and higher difficulty scores.

According to a study conducted by Oliveira *et al.* (2017), in the view of the judges, gymnasts consequently present very similar routines, with little innovation and no evident or described appreciation of this aspect, and with low variation in the discounts. Pizzol et al., (2017) present data on the average artistic discount suffered by the gymnasts who competed in Rio 2016 both on BB and on FX, demonstrating that there is in fact a low variation of these artistic discounts at all stages of the competition, supporting the hypothesis that the routines may be in line with the CoP concepts, or that the judges may not be evaluating them adequately. Such views agree with views related to the composition of the routines raised in our study, and in studies related to the artistic component carried out in other competitions, with different methods of analysis. (Pajek *et al.*, 2014; Pajek, 2015. The next CoP (2017-2021) brought some interesting innovations in this sense, such as withdrawal of the requirement of minimum D value for dismounts which allows gymnasts to perform a higher range of elements at the end of their routines, even if this element does not necessarily count toward the eight elements of greatest difficulty in the score (FIG, 2017; Atikovic & Kamenjasevic, 2021; Kalinski et al., 2021; Kezic et al., 2021).

Kalinski *et al.* (2011), Kerr & Obel (2015), Grossfeld (2014), Cuk (2016), and Nunomura *et al.* (2019) highlight the importance of specific types of exercises for the composition of routines and, consequently, for the difficulty value of the routines presented by WAG athletes. Despite the constant changes in the CoP in order to attach more value to the movement executions and ensure greater safety of the gymnasts, better interpretation for the judges on the specificity of each of the movements performed, and also for better appreciation of the sport by the media (Oliveira & Bortoleto, 2009; Grossfeld, 2014; Nunomura *et al.*, 2019), there is still an increased appetite for high difficulty scores. This leads us to think that performance in the sport is linked to this component.

Since the change of the "closed" code (with a maximum score of 10 points), which occurred in 2005, to the "open" code with no maximum possible score for a gymnast (Oliveira & Bortoleto, 2009; Kerr & Obel, 2015; Grossfeld, 2014; Nunomura *et al.*, 2019), the difficulty value has been given more attention in the CoP and can be calculated in different ways, with different numbers of elements and with different compositional requirements. Such changes have created an incessant search for an ideal method for this calculation that can value both the difficulty of the gymnasts' elements and how they are carried out in a balanced and coherent way.

In addition, the CoP undergoes evaluations and modifications by the Technical Committee of the FIG throughout each Olympiad and tries to improve the organization and structure of AG worldwide and to make it safe and fair for its practitioners while also trying to keep up with the demands from the public and the media. As such, it serves as the foundation for training, judgment, and evolution of the sport (Oliveira & Bortoleto, 2009; Ferreirinha & Barata, 2009).

It is evident that the composition of routines by top gymnasts follow the changing trends of the CoP. Gymnasts adapt their training, learning and routines to the document, and follow the changing aspects of the elements that will be part of their routines in terms of value, form of execution and compliance with requirements, for example. This makes their routines even more similar.

Hence, the artistic component of AG is fundamental for competitions since it is the main component that clearly differentiates not only one routine from another but also the entire process that gymnasts undergo to arrive at a given competitive moment. It therefore also deserves special attention from coaches, technical committees, spectators, and the academic community.

CONCLUSION

Our data analysis has verified that almost all the routines analyzed in the qualifying phase in WAG at the Rio 2016 Olympic Games met the FIG standards as regulated by the CoP. It has shown that the CoP also has the purpose of influencing gymnasts' routines through the years between the Olympics, guiding the process and, training.

We can also infer that there is an assembly line of routines repeated by several gymnasts of different nationalities, due to the CoP regulations. The most difficult acrobatics, dance elements, connections, and uses of different elements end up repeating themselves, even if involuntarily, probably due to the valorization or devaluation of a particular group of elements that occurs with each re-edition of the CoP. In this sense, the FIG, responsible for directing the sport through the CoP, could devise strategies to better use the elements present within its stipulated rules.

The updated values, forms of execution, and observations of the execution failures in exercises end up

guiding the composition of the routines and the execution of certain elements inserted in them. Therefore, both coaches and gymnasts must be aware of the CoP changes and thus be able to compose their routines in the best possible way, exploring the various possibilities within the sport's rules and prerequisites.

Finally, we highlight the need for further research of the ways FIG regulations play a role in each Olympiad for gymnasts, coaches, judges, and others involved with the sport. We also highlight the existing gaps in the "rules" of the sport that deserve to be better analyzed and restructured for subsequent Olympiads. It has been observed that many routines follow the same pattern from the setup to the execution in order to meet the requirements of the CoP and get the least penalty.

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Corresponding author:

Mateus Henrique de Oliveira
School of Physical Education, UNICAMP
701, Érico Veríssimo avenue,
Cidade Universitária, Zeferino Vaz, Barão Geraldo, Campinas,
São Paulo/Brazil
E-mail: matthenri0@gmail.com
Tel and fax num: +55 (11) 991970931

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