INDIVIDUAL APPARATUS RESULTS OF FEMALE ALL AROUND OLYMPIC CHAMPIONS

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Original article

Abstract

The changes of Code of Points stimulate the rise in exercise difficulty and a drive towards increased specialization of gymnasts. We inspected the performance of all-around medalists at individual apparatus finals to analyze the trends in their efficiency to reach the podium. Data from Olympic games 1952-2016 was included in this retrospective study. In the period form 1952-1984 there were 5 occasions when all-round winners reached 75 to 100% efficiency in reaching the podium at all individual apparatus finals. However overall, there is a clear trend of diminished efficiency of all-around winners to reach the podium at individual finals in the observed period (1952-2016) from the average of 7.7 medals in the first three observed events to 4.3 medals at the last three observed events. Olympic all-around champion efficiency was calculated from sum of all medals won by all-around champions on apparatuses divided by 4. This efficiency has decreased from 91.7% in the first three events to 41.7% in the last three events. In recent events all-around champions still managed to win at least one medal on single apparatuses as there was only one exception to this rule at 2012. It is very much probable that in the future all-around champions will excel further at single apparatus finals; however a huge predominance of all-around champions at apparatus finals cannot be expected any more.

Key words: *history, artistic gymnastics, development.*

INTRODUCTION

The Olympic Games (OG) are a major international multi – sport event. Becoming an Olympic champion is a dream of many elite athletes. Many years of practice are needed to achieve the top level performance in gymnastics. It takes around 10 000 working hours or minimum of 10 years to achieve the Olympic quality (Arkaev & Suchilin, 2004; Ericsson, Charness, Feltovich and Hoffman, 2006; Gladwell, 2008; Malina, 2010; Fink & Hofmann, 2015; Fink, Hofmann, & Ortiz Lopez, 2015). But, unfortunately, top level performance may not be enough to become an Olympic champion; during the history of OG, some boycotts due to political issues were executed, that prevented top level athletes to compete and also the OG competition regulations became more demanding. Nevertheless, being the Olympic champion is still regarded as the biggest achievement of every athlete.

Artistic gymnastics is one of the disciplines that have always featured the Olympic program (Wallechinsky, & Loucky, 2012). Female gymnastics made its first appearance at OG in Amsterdam, 1928, with a team event. Only a team exercise with rhythmic apparatus and one exercise on chosen apparatus was allowed. Women competed in suits and only male judges were allowed to judge (Bučar, 1998). Women's artistic gymnastics was not staged in 1932 but it reappeared in 1936 (Topends sports, 2018). In 1933 female technical committee was founded and it governs the development of female artistic gymnastics ever since. Its rules were summarized in the Code of Points (COP) (Bučar, 1998). In 1952 at OG in Helsinki female program expanded to seven events and in Rome, 1960, gained its final form of six events (Wallechinsky, & Loucky, 2012): team competition, all around and four apparatus disciplines – vault, uneven bars, balance beam and floor.

In the 1950s and 1960s COP focused on artistry and was largely inspired by ballet (Atiković, Delaš Kalinski, & Smajlović, 2017; Atiković, Delaš Kalinski, & Čuk, 2017). At that time Larysa Latynina (Russia, ex – Soviet Union) and Vera Časlavska (Czech, ex – Czechoslovakia) dominated the women artistic gymnastics (Wallechinsky, & Loucky, 2012). Since then artistic gymnastics became more demanding in terms of complexity and difficulty of elements. It was not only enough to perform higher, faster and stronger elements, but the technical execution of elements gained crucial impact as well (Zurc, 2017). Increments in element difficulty were paralleled by the rise of precision of judging and its regulation (Čuk, & Atiković, 2009; Čuk, & Forbes, 2010; Bučar Pajek, Forbes, Pajek, Leskošek, & Čuk, 2011; Bučar Pajek, Čuk, Pajek, Karácsony & Leskošek, 2012; Bučar Pajek, Čuk, Pajek, Kovač, & Leskošek, 2013; Delaš Kalinski, Atiković, Jelaska, & Milić, 2016). Changes of COP occured from one Olympic cycle to another with a strong influence on artistic gymnastics development. In the period from 1952 to 1996 gymnasts had to perform two routines on each apparatus – a compulsory and an optional one. Until 2006, upper limit of the score was set to a fixed number (mostly up to 10.0 points). From 2006 on, exercises are being evaluated upon open-end score: the content and the exercise difficulty determine gymnast's theoretical maximum score (FIG, 2006).

These changes stimulated a general rise in exercise difficulty and could have been a driver towards increased specialization of gymnasts. From this point of view, it would be useful to inspect the performance of all-around medalists at individual apparatuses to analyze the historical perspective of competitors that excel as all-around performers. Such an analysis would also help to predict the future developments of this sport. Aim of our research was therefore set to analyze the timely trends of success of all-round medalists at individual apparatuses at the OG.

METHODS

We collected all data on OG results from Wallechinsky, & Loucky, 2012 and from gymnasticsresults.com in the period from OG 1952 up to OG 2016. We included following variables at each OG: number of participants, number of participant nations, identity of any gymnast that won a medal at all-around competition and individual apparatuses, sum of all medals won by all-around medalists, sum of gold medals won by all-around medalists, sum of silver medals won by all-around medalists, sum of bronze-medals won by all around medalists, sum of all medals won by the all-around medalists (excluding team medals) on individual apparatuses (three all-around medalists could get 12 medals at individual apparatuses in total, as each all-around medalist can earn maximum 4 apparatus medals). With this sum of medals, we calculated Olympic all-around champion efficiency (all individual apparatus medals of all-around winners divided by 4). We also determined which all-around champions earned most apparatus medals.

RESULTS

Results are showed in Figures and Tables. In first five Figures number of gymnasts and nations at Olympic games qualifications at all around competitions, vault, uneven bars, balance beam and floor are shown.

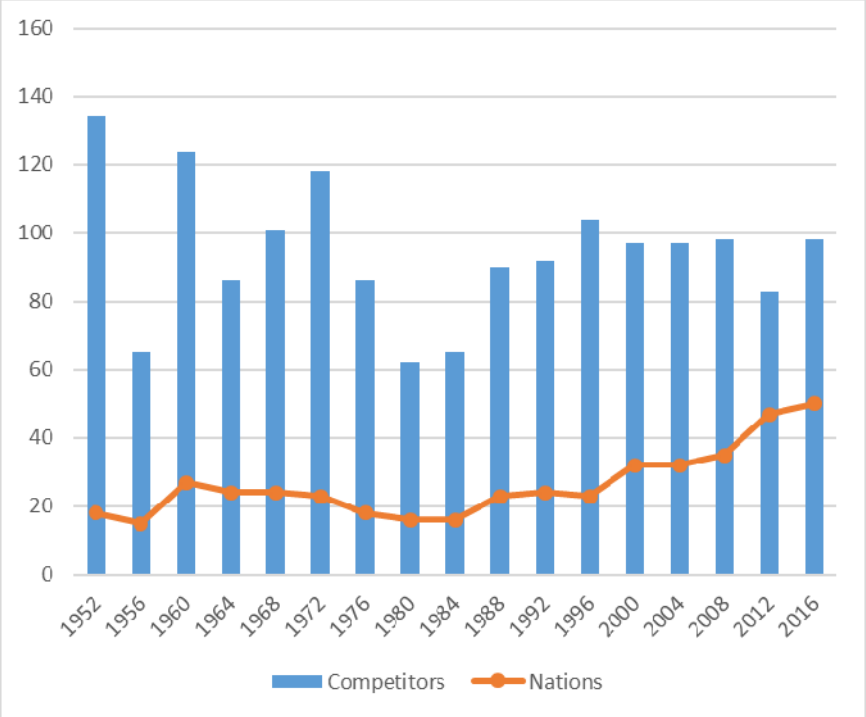

Figure 1. Number of gymnasts and nations at Olympic games in all-around qualifications.

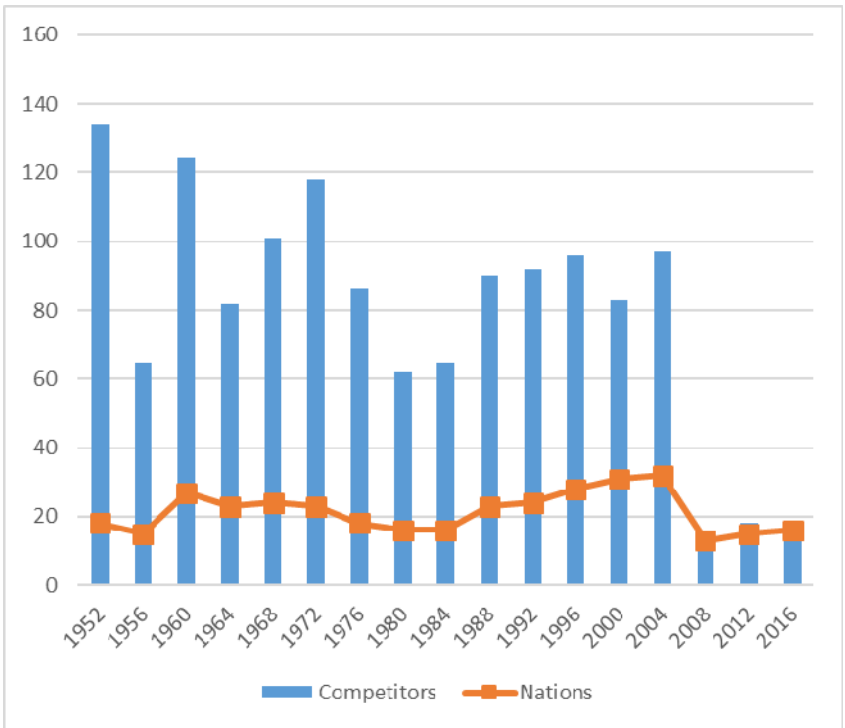

Figure 2. Number of gymnasts and nations at Olympic games on vault qualifications.

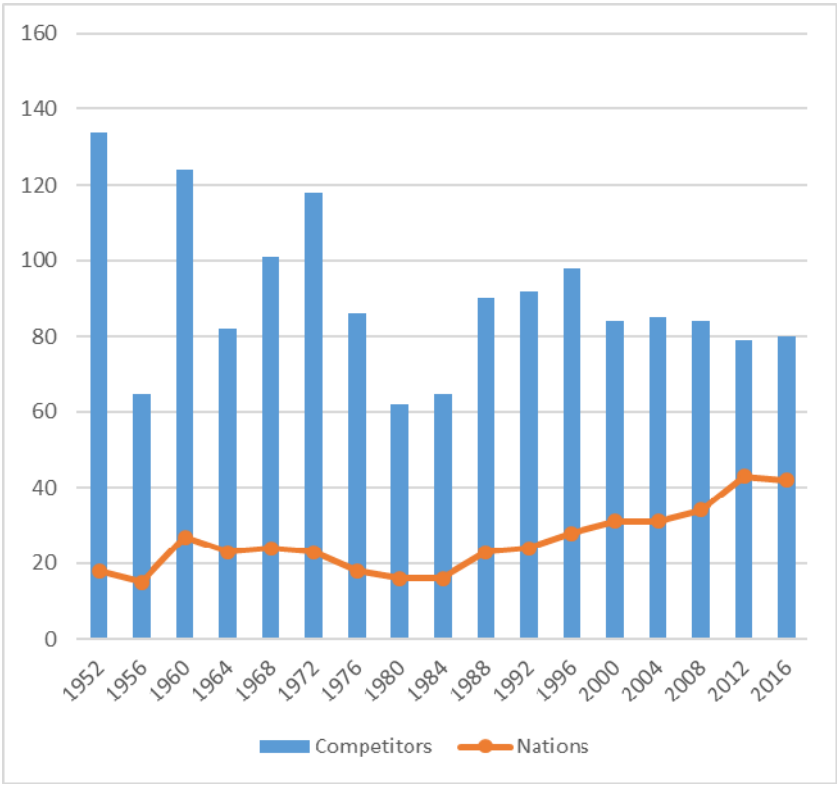

Figure 3. Number of gymnasts and nations at Olympic games on uneven bars qualifications.

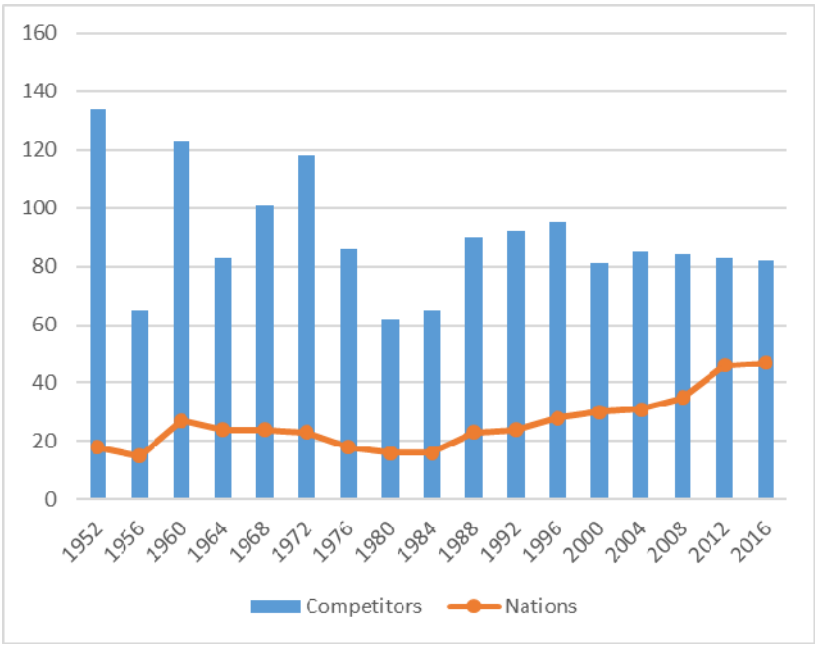

Figure 4. Number of gymnasts and nations at Olympic games on balance beam qualifications.

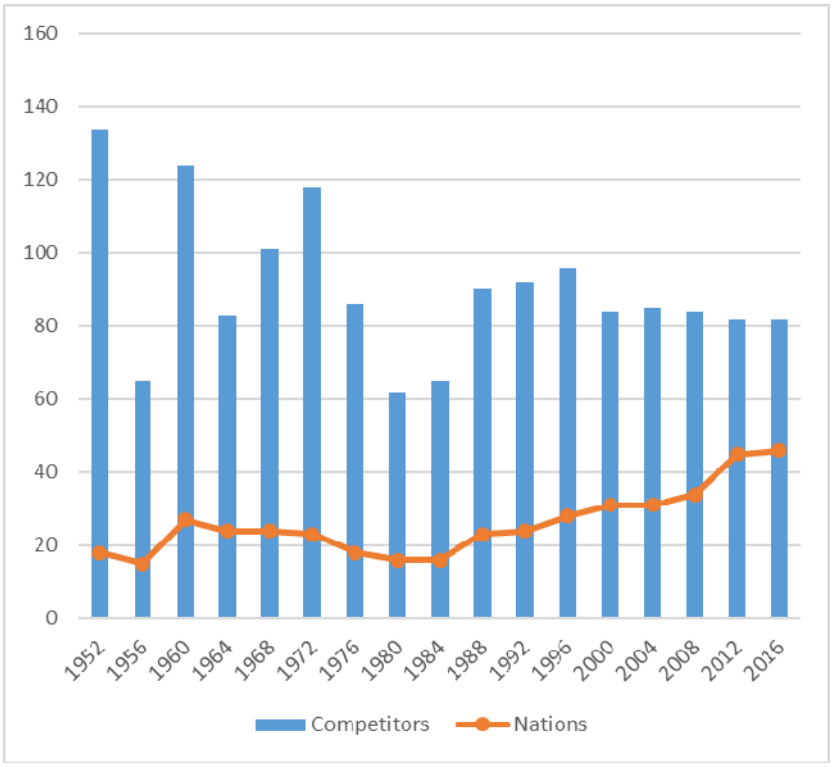

Figure 5. Number of gymnasts and nations at Olympic games on floor qualifications.

Table 1 shows the year and place of each OG, names of gymnasts who won medals in all-around competitions and individual apparatuses. Names of medalists are shown in the sequence related to the place they achieved: first name identifies the first place (gold medal), the second name identifies second place (silver medal) and the third name identifies third place (bronze medal).

Table 1
Names of gymnasts who won medal in all around and apparatus finals.

Year	*Place*	*All around*	*Vault*	*Uneven bars*	*Balance beam*	*Floor*
1952	Helsinki	Gorochovskia Maria Bocharova Nina Korondi Margit	Kalinchuk Yekaterina Gorochovskia Maria Minaicheva Galina	Korondi Margit Gorochovskia Maria Keleti Agnes	Bocharova Nina Gorochovskia Maria Korondi Margit	Keleti Agnes Gorochovskia Maria Korondi Margit
1956	Melbourne	Latynina Larysa Keleti Agnes Muratova Sofia	Latynina Larysa Manina Tamara Colling-Pettersson Ann S.	Keleti Agnes Latynina Larysa Muratova Sofia	Keleti Agnes Bosakova Eva Manina Tamara	Keleti Agnes Latynina Larysa Leustean Elena
1960	Rome	Latynina Larysa Muratova Sofia Astakhova Polina	Nikolayeva Marharyta Muratova Sofia Latynina Larysa	Astakhova Polina Latynina Larysa Lyukhina Tamara	Bosakova Eva Latynina Larysa Muratova Sofia	Latynina Larysa Astakhova Polina Lyukhina Tamara
1964	Tokio	Časlavska Vera Latynina Larysa Astakhova Polina	Časlavska Vera Latynina Larysa Radochia Birgit	Astakhova Polina Makray Katalin Latynina Larysa	Časlavska Vera Manina Tamara Latynina Larysa	Latynina Larysa Astakhova Polina Janosi-Ducza Aniko
1968	Mexico City	Časlavska Vera Voronina Zinaida Kuchinskaya Natalya	Časlavska Vera Zuchold Erika Voronina Zinaida	Časlavska Vera Janz Karin Voronina Zinaida	Kuchinskaya Natalya Časlavska Vera Petrik Larissa	Časlavska Vera Petrik Larissa Kuchinskaya Natalya
1972	Munich	Turischeva Lyudmila Janz Karin Lazakovich Tamara	Janz Karin Zuchold Erika Turischeva Lyudmila	Janz Karin Korbut Olga Zuchold Erika	Korbut Olga Lazakovich Tamara Janz Karin	Korbut Olga Turischeva Lyudmila Lazakovich Tamara
1976	Montreal	Comaneci Nadia Kim Nelli Turischeva Lyudmila	Kim Nelli Dombeck Carola Turischeva Lyudmila	Comaneci Nadia Ungureanu Teodora Egervari Marta	Comaneci Nadia Korbut Olga Ungureanu Teodora	Kim Nelli Turischeva Lyudmila Comaneci Nadia
1980	Moscow	Davydova Yelena Comaneci Nadia Gnauck Maxi	Shaposhnikova Natalya Kraaker Steffi Ruhn Melita	Gnauck Maxi Eberle Emilia Egervari Marta	Comaneci Nadia Davydova Yelena Shaposhnikova Yelena	Comaneci Nadia Kim Nelli Gnauck Maxi
1984	Los Angeles	Retton Mary Lou Szabo Ecaterina Pauca Simona	Szabo Ekaterina Retton Mary Lou Agache Lavinia	Yanhong Ma McNamara Julianne Retton Mary Lou	Pauca Simona Szabo Ecaterina Johnson Kathy	Szabo Ecaterina McNamara Julianne Retton Mary Lou
1988	Seoul	Shushunova Yelena Silivas Daniela Boginskaya Svetlana	Boginskaya Svetlana Potorac Gabriela Silivas Daniela	Silivas Daniela Kersten Dagmar Shushunova Yelena	Silivas Daniela Shushunova Yelena Mills Phoebe	Silivas Daniela Boginskaya Svetlana Dudeva Diana
1992	Barcelona	Gutsu Tatyana Miller Shannon Milosovici Lavinia	Milosovici Lavinia Onodi Henrietta Lysenko Tetiana	Li Liu Gutsu Tatyana Miller Shannon	Lysenko Tetiana Li Liu Miller Shannon	Milosovici Lavinia Onodi Henrietta Bontas Christina
1996	Atlanta	Podkopayeva Lilia Gogean Gina Amanar Simona	Amanar Simona Huilan Mo Gogean Gina	Khorkina Svetlana Wenjiing Bi Chow Amy	Miller Shannon Podkopayeva Lilia Gogean Gina	Podkopayeva Lilia Amanar Simona Dawes Dominique
2000	Sydney	Amanar Simona Olaru Maria Liu Xuan	Zamolodchikova Yelena Raducan Andreea Lobaznyuk Yekaterina	Khorkina Svetlana Ling Jie Yang Yun	Xuan Liu Lobaznyuk Yekaterina Produnova Yelena	Zamolodchikova Yelena Khorkina Svetlana Amanar Simona
2004	Athens	Patterson Carly Khorkina Svetlana Zhang Nan	Rosu Monica Hatch Annia Pavlova Anna	Lepennec Emilie Humphrey Terin Kupets Courtney	Ponor Catalina Patterson Carly Eremia Alexandra G.	Ponor Catalina Sofronie Nicoleta Daniela Moreno Patricia
2008	Beijing	Liukin Nastia Johnson Shawn Yang Yilin	Hong Un Jong Chusovitina Oksana Cheng Fei	He Kexin Liukin Nastia Yang Yilin	Johnson Shawn Liukin Nastia Cheng Fei	Izbasa Sandra Raluca Johnson Shawn Liukin Nastia
2012	London	Douglas Gabrielle Komova Victoria Mustafina Aliya	Izbasa Sandra Raluca Maroney Mc Kayla Paseka Maria	Mustafina Aliya He Kexin Tweeddle Elizabeth	Deng Linlin Sui Lu Raisman Alexandra	Raisman Alexandra Ponor Catalina Mustafina Aliya
2016	Rio de Janeiro	Biles Simone Raisman Alexandra Mustafina Aliya	Biles Simone Paseka Maria Steingruber Gulia	Mustafina Aliya Kocian Madison Scheder Sofie	Wevers Sanne Hernandez Lauren Biles Simone	Biles Simone Raisman Alexandra Tinkler Amy

Figures 6 to 10 show sum of all medals won by all around medalists, sum of gold medals won by all around medalists, sum of silver medals won by all around medalists, sum of bronze medals won by all around medalists.

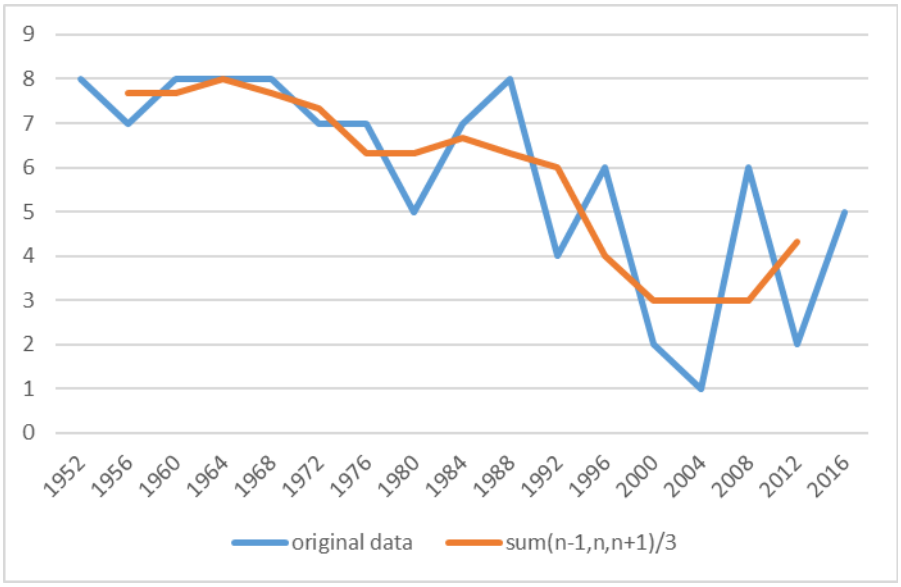

Figure 6. Sum of all medals won by all around medalists. Legend: Blue line denotes the absolute sum of all medals. Orange line denotes trends (sum of all medals at previous (n-1), recent (n) and next (n+1) OG divided by 3.

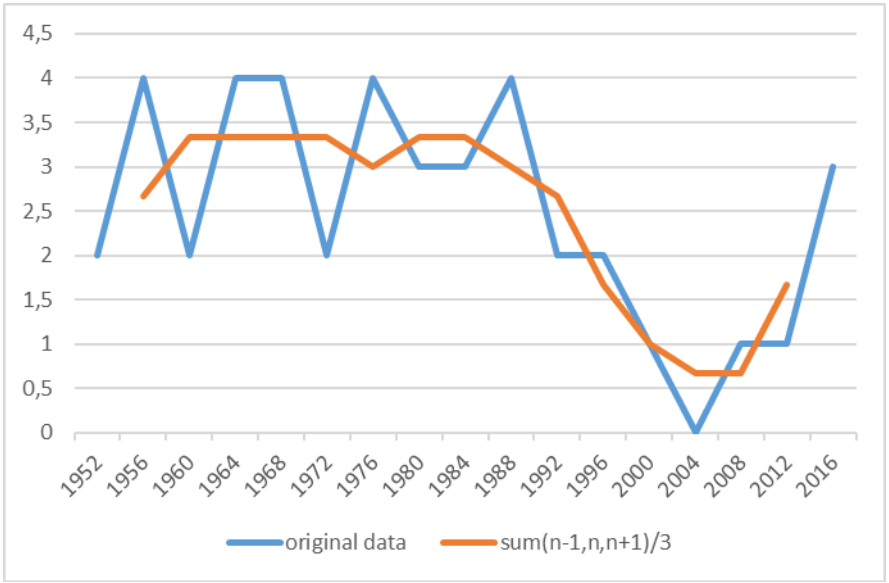

Figure 7. Sum of gold medals won by all around medalists. Legend: Blue line denotes the absolute sum of all medals. Orange line denotes trends (sum of all medals at previous (n-1), recent (n) and next (n+1) OG divided by 3.

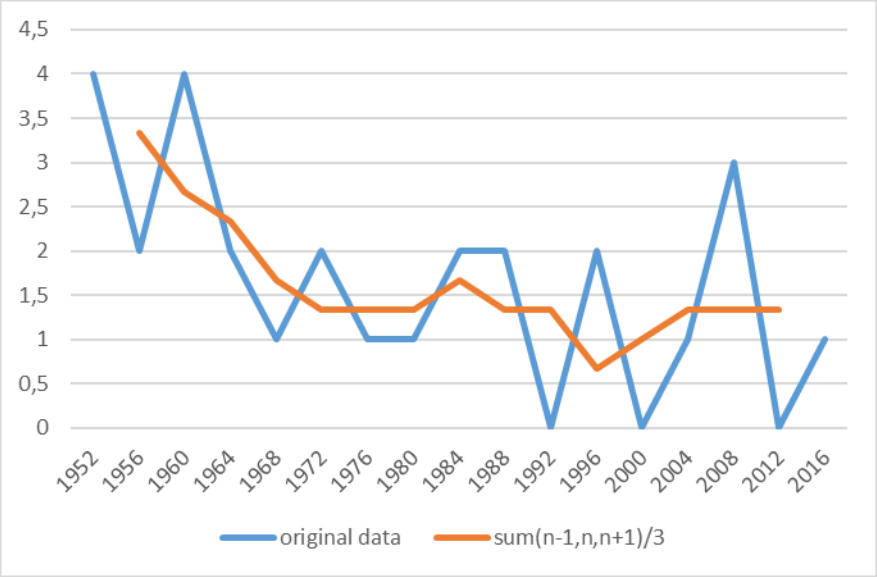

Figure 8. Sum of silver medals won by all around medalists. Legend: Blue line denotes the absolute sum of all medals. Orange line denotes trends (sum of all medals at previous (n-1), recent (n) and next (n+1) OG divided by 3.

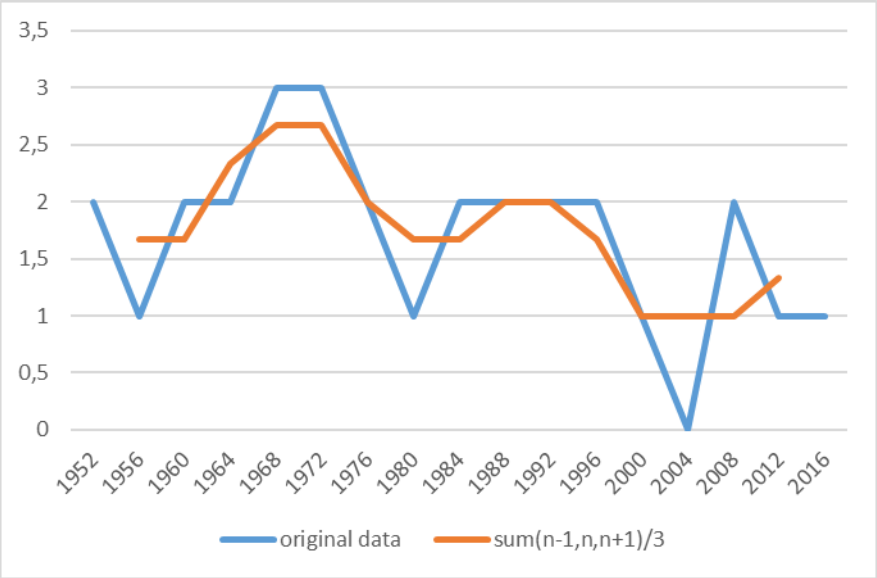

Figure 9. Sum of bronze medals won by all around medalists. Legend: Blue line denotes the absolute sum of all medals. Orange line denotes trends (sum of all medals at previous (n-1), recent (n) and next (n+1) OG divided by 3.

Olympic all-around champion efficiency was calculated (Figure 10) from sum of all medals won by all-around champions on apparatuses divided by 4 (maximum 4 apparatus medals can be earned by each all-around champion).

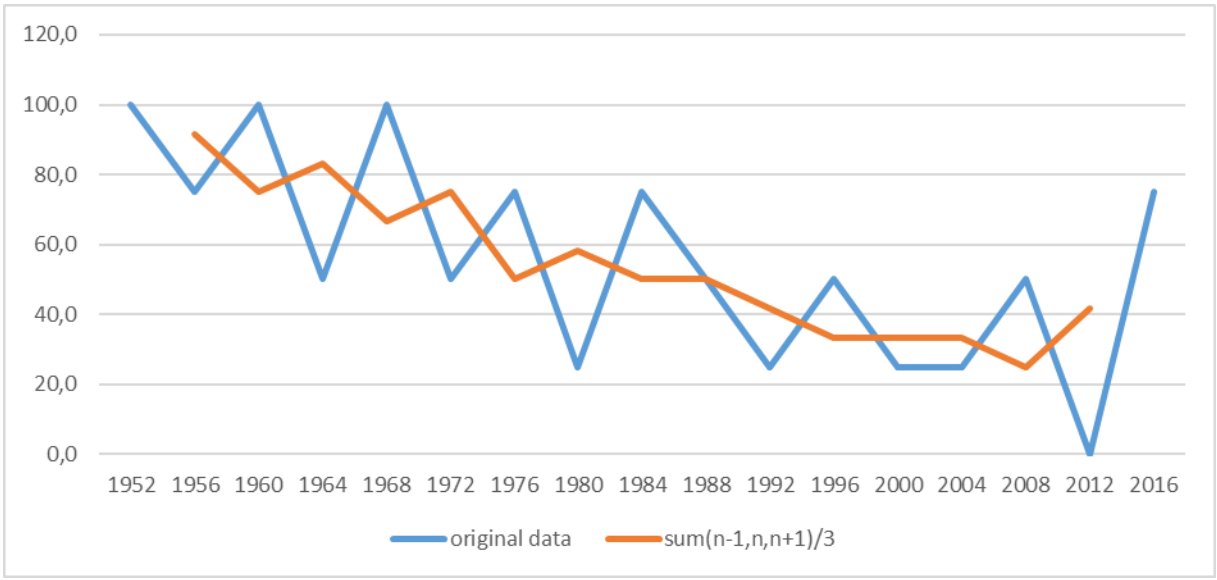

Figure 10. Olympic Champion efficiency trend of all around champions.

DISCUSSION

Number of gymnasts and number of nations participating at OG varies during observed period of time (Figure 1 - 5). Greater declines are detected for Melbourne, 1956, for Moscow, 1980, and Los Angeles, 1984. At summer games there had been 5 boycotts (Wikipedia, 2018) in the observed period and all three games 1956, 1980 and 1984 are included. In 1956 boycotting countries were: Egipt, Iraq, Lebanon, Netherlands, Cambodia, Spain, Switzerland and Peoples Republic of China. In 1980 boycotting countries were: Albania, Antigua and Barbuda, Argentina, Bahamas, Bahrain, Bangladesh, Barbados, Belize, Bermuda, Bolivia, Canada, Cayman Islands, Central African Republic, Chad, Chile, China, Egypt, El Salvador, Fiji, Gabon, Gambia, Ghana, Haiti, Honduras, Hong Kong, Indonesia, Iran, Israel, Ivory Coast, Japan, Kenya, South Korea, Liberia, Liechtenstein, Malawi, Malaysia, Mauritania, Monaco, Mauritius, Morocco, Netherlands Antilles, Niger, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Philippines, Qatar, Saudi Arabia, Singapore, Somalia, Sudan, Suriname, Swaziland, Chinese Taipei, Thailand, Togo, Tunisia, Turkey, United Arab Emirates, United States, Uruguay, United States Virgin Islands, West Germany, Zaire. In 1984 boycotting countries were: Soviet Union, Bulgaria, East Germany, Mongolia, Vietnam, Laos, Czechoslovakia, Afghanistan, Hungary, Poland, Cuba, South Yemen, North Korea, Ethiopia, Angola, Albania, Iran, Lybia (Wikipedia, 2018). This explains the lower number of participants at those games. Among listed countries we can find very powerful gymnastic countries and one can speculate that results could be different if all eligible participants would compete. After Rome, 1960, number of nations continually declined until OG 1984 (Los Angeles, USA), mostly due to political reasons. After OG 1984 (Los Angeles, USA) numbers of participants varied but number of nations competing at qualifications is in constant incline (except at OG 1996, Atlanta, USA). After OG 1988 (Seul, South Korea) many countries divided into smaller states (i.e. Soviet union, Yugoslavia, Czechoslovakia), but surprisingly the number of participants and nations at women's artistic gymnastic stayed almost the same. After OG 1992 the number of nations was constantly rising. In Atlanta, 1996, compulsory exercises had to be performed for the last time at OG and in 2000 the number of nations raised. Also at Athens, 2004, the maximum score was set at

10.00 points for the last time. After that the COP changed substantially and that was the beginning of open ended scores. After this there was a constant raise of nation number at OG.

The situation on vault is very interesting: we can observe how the changes in COP influenced the number of competitors on vault, and also how numerous nations managed to find an opportunity for a good result on this apparatus. At Beijing 2008, the number of participants on vault dropped significantly, mostly due to changes in COP where only one vault is necessary at all-around competition. If competitor wanted to compete in vault finals she needed to perform two different vaults. With open ended COP not many competitors had 2 different vaults with high enough difficulty. It is interesting to see that the number of nations competing at vault is relatively high: 13 nations and 15 competitors at Beijing 2008, 15 nations and 18 competitors at London, 2012, and 16 nations and 19 competitors at Rio de Janiero, 2016.

Table 1 shows names of all medalist from observed period at all around competitions and apparatus finals. Only 2 competitors won all-around tittle twice: Larysa Latynina (Russia, ex – Soviet Union) won all-around title at OG 1956 (Melbourne, Australia) and OG 1960 (Rome, Italy) and Vera Časlavska (Czech, ex – Czechoslovakia) won OG 1964 (Tokio, Japan) and OG 1968 (Mexico City, Mexico).

It should be noted that all-around finals started to be organized as a separate competition in Munich, 1972 (Wallechinsky, & Loucky, 2012). Before that there was no extra competition for all around finals, they just announced all-around medalists based on a common competition that contained four apparatuses and also served as a qualification for single apparatus finals. Apparatus finals was organized for the first time at Melbourne, 1956.

Figure 6 shows a good success of all-around medalists at apparatus finals. At the beginning of observed period the number of apparatus medals were very high (up to 8 from 12 possible medals), but with the advent of a more demanding and complexed element structure the ability of achieving podium by all-around medalists is slowly dropping. Figures 6 to 9 show sum of gold, silver and bronze medals won by all-around medalists. Trends are similar as described above. Figure 10 shows efficiency of all around champions on apparatus finals. From the whole history of women artistic gymnastics winner in all-around competition is considered as the queen of gymnastics. At Helsinki, 1952, Rome, 1960, and Mexico City, 1968 competitions, the efficiency was of all-round champions was 100%. In these cases all-around champion also got gold, silver or bronze medal at each out of the four apparatus finals. We can also see that there were 4 Olympic champions with 75% efficiency – meaning that they took 3 medals at apparatus finals. The exact names of the all-around champions and their success at individual apparatus competitions are shown in the table 1. The only case in the whole OG history regarding women's artistic gymnastics when efficiency of all-round champion was 0% was at London, 2012 where the Olympic champion didn't take any medals at apparatus finals. We can conclude that all-around gymnasts play an important role at apparatus finals however the predomination of distinctive specialists on apparatuses is slowly emerging in the last period and the efficiency of all-around champions at individual apparatuses is dropping. There are however certain exceptions, for example see the strong predominance of Simone Biles at Rio de Janiero, 2016, who shifted all statistics upwards. There is also a strong influence of rules of OG qualification since they favor the qualification of all-round competent gymnasts; dedicated apparatus specialists have a more difficult task to qualify for OG. With only 4 apparatuses from which three of them are directly related to acrobatics (vault, balance beam, floor) most gymnasts are still expected to compete on all four apparatuses. Therefore we can expect to see

continuing success of all-around medalists at apparatus finals. However the obvious trend shows that the supreme efficiency of all-around champions to reach the podium at majority apparatus finals cannot be expected any more.

Drawbacks of our study include the limitation of each all around champion's efficiency to a single OG event (some competitors have competed at more than one event and a possible extension of analysis to their performance at all relevant OG events was not done). On the other hand, a full coverage of modern gymnastic era with four apparatuses is covered by our analysis and this is a strength of our study.

CONCLUSIONS

Our results show that with the advent of a more demanding and complexed element structure the ability of achieving podium by all-around medalists is dropping. A very high efficiency of all-around champions to reach the podium at every apparatus final has dropped and this trend parallels the trend of diminishing sum of individual apparatus medals that have been earned by all-around medalists. This may be a sign of increased success of more specialized competitors. With only four disciplines within all-around competition, and with three of them directly related to acrobatics, we can expect to see continuing success of all-around medalists at apparatus finals. However, a clear trend shows that the supreme efficiency of all-around champions to reach the podium at majority apparatus finals cannot be expected any more.

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