

THE CODE OF POINTS AND THE CAREER DEVELOPMENT IN WOMEN'S ARTISTIC GYMNASTICS

Nunomura Myrian¹, Roslyn Kerr², Georgia Cervin³, Astrid Schubring⁴,
Natalie Barker-Ruchti^{4,5}

¹University of São Paulo, Ribeirão, Brazil

²Lincoln University, Department of Tourism, Sport and Society, Lincoln, Canterbury
New Zealand

³University of Western Australia, History Discipline Group, Crawley, Australia

⁴University of Gothenburg, Department of Food and Nutrition and Sport Science, Gothenburg
Sweden

⁵Örebro University, School of Health Sciences, Division of Sport Science, Örebro, Sweden

Original article

Abstract

The premise of this article is that the rules of Women's Artistic Gymnastics (WAG) as outlined in the Code of Points significantly affect the experiences of older gymnasts in both positive and negative ways. The aim of this study was to explore the perceptions of gymnasts, coaches, and judges on the WAG rules and the body ideals, age and career length in Brazil. We draw on qualitative interviews with a sample of two coaches and seven gymnasts from the Brazilian national team, and four judges with international experience. Both coaches and gymnasts perceived younger bodies to be more responsive to the actual rules requirements regarding difficulty and training demands. On the other hand, older gymnasts were felt to be advantaged due to being able to perform more artistically and with less mistakes. Results will allow both the FIG and the Brazilian Gymnastics Federation to reflect on the way the demands of the Code of Points affect the experiences of gymnasts. As our article finds both the rules and the established WAG culture affect gymnasts, both needs to be considered in order to keep healthy gymnasts in the sport longer.

Key words: *women's artistic gymnastics, body ideals, career development, ageing, rules.*

INTRODUCTION

When women first participated in the modern Olympic Games (OG) in 1928 in Amsterdam, gymnasts aged between 20-35 years dominated Women's Artistic Gymnastics (WAG). Although this age range remained within the sport, the demographic shifted, and by the 1970s Olga Korbut and Nadia Comaneci demonstrated that the face – and body ideal – of the sport had changed (Barker-Ruchti, 2009; Blue,

1987; Claessens, et al., 2006; Kerr, 2006; Ryan, 1995). Indeed, since then, WAG has been characterized as a problematic child sport. Partly in response to such criticisms, the Federation Internationale de Gymnastique (FIG) increased the minimum age from 14 in 1970, to 15 in 1980, and later 16 in 1997 (Anderson, 1997; Atikovic et al., 2017; Cervin, 2017; Kerr, 2006).

Although older gymnasts still competed, performed, and succeeded after the rise of the child-style body ideal in the 1970s, they received less attention from spectators and media, exacerbating the notion of WAG as a child sport (Cervin, 2016; Kerr, 2006). However, recently several gymnasts have emerged at the top international level of considerably older age. Indeed, the mean average of WAG competitors has increased from 17.6 in the 2000 Olympic Games to 20.29 in the 2016 Olympic Games (FIG, 2018). Exemplifying this trend is Oksana Chusovitina, who has competed at a remarkable 11 World Championships, including Montreal 2017, and seven OG, including Rio de Janeiro in 2016 when she was 41 years of age. Others competing in 2016 included Daniele Hypólito, the 31-year-old Brazilian gymnast in her fifth OG and Jessica Lopez, age 30, from Venezuela and Catalina Ponor, at 28, from Romania, both of whom competed in their third OG. They are high profile examples of gymnasts who are defying the adage of youth in WAG, prolonging their careers up into adulthood. This trend raises questions about the conditions that allow these and other older gymnasts to continue competing on the international stage so long, particularly, given its divergence from historical trends. In this article, we wish to examine the link between a greater number of older gymnasts performing at the highest level of competition and the rulebook for gymnastics – the Code of Points (CoP). The FIG is responsible for the CoP, updating it every four years. It prescribes all matters of gymnastics performance, judging at competitions, and gymnast and coach conduct during competitions. For the purpose of this article, we are particularly interested in gymnastics performance requirements, which gymnasts must fulfil in their routines. The FIG uses the CoP, for instance, to encourage particular movements or gymnastics styles, including acrobatics and artistry. In our examination of the connections between the older gymnast population and the requirements of the CoP, we will specifically focus on how a sample

of 7 current and former Brazilian national team gymnasts and two of their coaches, and four active international judges, perceived the abilities of older gymnasts, and described the impact of the rules dictated by the CoP. We focus on these two issues because our earlier research has indicated that stakeholders' perceptions of age and performance, and CoP rules, are two elements that are changing current gymnastics ideals and norms, gymnastics performance, coaching, and the gymnast careers (Barker-Ruchti, Kerr, Schubring, Cervin, & Nunomura, 2017; Kerr, Barker-Ruchti, Schubring, Cervin, & Nunomura, 2017). We choose the Brazilian case because over the last decade, there have been eight gymnasts in the national team aged over 20 and recently, Brazilian gymnasts have achieved medals at World Cups and World Championships competitions.

In the following, we begin by covering existing literature on that describes CoP rule changes over time and the implications this has for gymnasts. We then present the research methods, and discuss the results we have found. We conclude the article with a summary of our findings.

No other sport seems to change the rules as often as Artistic Gymnastics. Atikovic et al. (2017), reported that from 1964 to the present, the WAG CoP has gone through 14 versions, and gymnasts, coaches, and judges have been challenged due to the dynamicity of the Code of Points. In Oliveira, et al. (2017), it is shown how Brazilian International brevet judges need to continuously study the CoP as element values, combinations, requirements, and deductions change regularly.

The CoP dictates the rules of the WAG competition and is usually updated every Olympic cycle. The changes have implications for the athletes' selection, development, and consequences for the prolongation of the career. Those changes vary from requirements, skills and combinations values, number of team members, apparatuses, minimum age of

participation, deductions, scoring, routine composition, etc.

According to Kerr & Obel (2014, p.3), the scoring system in WAG aims “to ensure that the winning gymnast is the one who performs with the highest levels of difficulty (what is performed), and execution and artistry (how it is performed)”. In WAG, gymnasts are required to present artistic competency through dance and choreography. However, there are still discussions about the effectiveness of the CoP, as difficulty is easier to quantify than artistry (Kerr & Obel, 2014; Oliveira et al. 2017).

Since the appearance of Korbut and Comaneci, the phenomenon of “acrobatization” in the mid-70 gave rise to the introduction of younger gymnasts in WAG, as smaller and lighter bodies are biomechanically favoured for rotating and flying (Barker-Ruchti et al., 2017; Nunomura & Oliveira, 2014; Sands (2018). However, from 1977 to 1983, WAG became dominated by tiny girls performing high-level acrobatics who lacked artistic skills (Cervin, 2016, 2017; Kerr, 2006). Consequently, a number of changes took place in the 1990s. According to Atikovic et al. (2017), 1996 saw the introduction of 16 years as the minimum age for WAG participation in OG and the eradication of compulsory routines. In 2004, WAG adopted an “open-ended” scoring system, removing the perfect 10 as the highest possible score. Kerr & Obel (2014) analysed the disappearance of the 10 as maximum score and argued that “the new open-ended scoring resolved this problematic situation by enabling adequate rewarding of greater difficulty” (p.11). The authors also concluded that the new score system rewarded ‘the key values of the sport’, i.e., both difficulty and artistry. Given the constantly shifting goalposts of the sport due to the release of a new rulebook every four years, coupled with early selection and specialization, athlete development can be said to be closely tied to the rules of WAG.

Several studies raised the issue of age as important and significant in WAG (Anderson, 1997; Claessens et al. 2005; Leglise, 2007, 1998; Nunomura & Oliveira, 2014). Indeed, the FIG has been very concerned with this question, and its increases to the minimum age have served several purposes. Motivations have included revitalizing artistry; protecting gymnasts’ health; promoting a more positive image of the sport amongst the public (Cervin, 2017); and to acknowledge medical research finding intensive training at a young age was causing a range of physical and psychological problems for WAG gymnasts (FIMS/WHO, 1998). Health problems that have been associated with high performance training and competition at a young age include deformity, eating disorders, and distorted body image (Caine et al., 2001; Cassas & Cassettari-Wayhs, 2006; Daly, Bass & Finch, 2001; Dresler et al., 1997; Lindholm et al., 1995; Martinsen et al., 2010; Mellerowicz et al., 2000; Tofler et al., 1996). Despite the FIG’s concern with age, there is a dearth of research examining the perceived abilities of older gymnasts.

Dionigi (2005) argues that more research is needed to understand the experiences of older athletes and the meanings that competitive sport can have for them. Similarly, Tulle (2008) argues that there is a paucity of theoretical work addressing the place of the older body in sport, while Lavalley & Robinson (2007) argue that issues around retirement need more attention in the sport of WAG, particularly in relation to the support systems around athletes and different national systems.

This study explores the understanding gymnasts, coaches, and judges have about the effects the CoP has on gymnasts’ age, body type and size as well as career length. By focusing on the perspective of key stakeholders within the sport, this research has the potential to shed new light on this much-debated topic.

METHODS

The research presented in this article is part of a larger international research project entitled 'Coming of age: Towards best practice in women's artistic gymnastics', initiated in 2013 (Kerr et al. 2013). This project has gained ethical approval from the Lincoln University Human Ethics Committee (HEC 2013-42) and the School of Physical Education and Sport of Ribeirão Preto, University of São Paulo, Research Ethics Committee (CAAE N° 39848514.2.0000.5659) in 2013 and 2014, respectively.

This study focused on Brazil due to the large number of older WAG athletes in the country combined with the Brazil's international success. Selection criteria were that gymnasts needed to be/have been at least 20 years of age at the time of competing at the highest international level (WC and OG), with 20 being the minimum age in which a gymnast could have theoretically experienced two OG. We also selected those coaches and judges who were/are coaching and judging these gymnasts.

To identify suitable participants in Brazil, the lead author drew on her local WAG network and contacted the Brazilian Gymnastics Federation. We contacted each potential participant and provided the relevant project information, including ethical safeguards. Once those contacted provided written consent to participate in the study, a suitable time and place for the interview was arranged.

Participants included four gymnasts who were retired at the time of the interview and three active gymnasts. All were female, with the active gymnasts ranging in age from 25 to 31 years and retired gymnasts from 22 to 29 at the time they finished their career. All gymnasts are Brazilians from three different states. All gymnasts had been part of the national team and competed at least at the WC level and/or participated in one or more OG. The two coaches had coached the gymnasts in the study and comprised of one female coach with 27

years of experience, and one male with 33 years of experience. The four judges were all female, active and internationally experienced at the time of the interview, having judged from four to ten Olympic cycles.

One interview was held with each participant using a semi-structured interview schedule with three sections. The first section, based on an oral history approach (Denzin & Lincoln, 2005), asked participants to outline biographical information. Questions addressed their entrance into WAG, successes, coaches and coach-gymnast relationships, and training experiences. The second section, based on a thematic approach (Flick, 2005), probed ideals relating to age, body and training in high-performance WAG. The interviewees were asked to describe situations and instances where these ideals impacted their gymnastics training and/or careers. The third section employed a reflective approach (Miethling & Krieger, 2004), within which they were asked to comment on two pictures, one of a young and sexually immature and one of an older and sexually mature high-performance gymnast. Interviewees were specifically asked to comment on how they felt the gymnast would perform and be successful. In all interviews, the research team employed the interview schedule as a foundation, but followed creative interviewing principles (Douglas, 1985) to allow room for the participants to lead their interviews. Two interviews were conducted via Skype as the participants were living outside of Brazil. Interviews were conducted in Portuguese and translation into English was undertaken following each interview. Interview lengths ranged from 43 to 96 minutes. Interviews were recorded digitally, and transcribed verbatim.

The coding process involved thematic analysis as described by Braun & Clarke (2006). In a first step, the leader author familiarized herself with the interview transcripts. In the next step, an inductive analysis was performed, which involves '... a process of coding the data without trying

to fit it into a pre-existing coding frame, or the researcher's analytic preconceptions' (Braun & Clarke, 2006, p.83). Following this, the first author used line-by-line analysis, to code the data and developed categories of analysis related to the research questions. This led to the identification of the themes: Difficulty and body and ageing; artistry, execution, and age.

RESULTS AND DISCUSSION

Two main foci of inquiry "the influence of the rules on the body type and ageing" and "the influence of the rules on the prolongation of the sporting career" guided the following presentation of findings. For each subtheme, representative quotes were chosen and translated from Portuguese into English and adjusted for readability by the main author. In line with the qualitative approach used for the study (see Braun and Clarke, 2006), we chose exemplary quotations to provide the reader with the sense of common themes that came through from the majority of the participants.

Difficulty, body, and ageing

One of the most important rationales for replacing the "perfect 10" with an open-ended scoring system was the way that it allowed a significant increase in difficulty (Kerr & Obel, 2014). Specifically, it meant gymnasts were able to raise the difficulty ceiling indefinitely depending on their abilities, rather than having a mathematical limit. In this study, we found that, from the perceptions of the gymnasts, this was a problematic change that made it difficult for gymnasts to continue. For example, one retired gymnast described: 15 years ago the rules were fine for me. I couldn't stand competing longer with the current rules, as endurance is needed to perform 5-6 acrobatics sequences on the floor, they perform 3-4 releases on the uneven bars! I almost couldn't perform 3 on the floor at that time! (Gymnast 5).

In this quotation, the gymnast refers to the increase in difficulty levels that occurred following the change to the open-ended Code of Points, and her own belief

that she would not be longer be able to be competitive in the current environment. While this gymnast did not specifically comment on age affecting her abilities, a judge commented that older gymnasts would struggle to meet the difficulty requirements: As the score 10 is gone, the more difficulties she presents, the higher the score can be, the stronger and lighter gymnasts will be favoured. The gymnasts who are competing for about 20 years will face more difficulty as the Code of Points changed much over the time. (Judge 4).

In making this argument, this judge assumes two relationships. First, that older gymnasts are less likely to be stronger and lighter, and that second, stronger and lighter gymnasts are more likely to be able to perform more difficulty. But not all participants agreed with this point of view. Indeed, several of the gymnasts were particularly critical of the discourse that lighter gymnasts produce better performances, using the dominant American gymnasts as examples. For example:

In the past, gymnasts were considered fat because they have developed breasts, but nowadays it changed a bit due to the American gymnasts, as they are heavier and powerful. Therefore, they realize that the gymnast doesn't need to be skinny as Khorkina to look beautiful in WAG (Gymnast 7).

Another gymnast expressed frustration over the emphasis on size rather than gymnastics, stating: "In Brazil we are too stuck on biotype, however, both slimmer and stockier can succeed in gymnastics. So, what does really matter, the size or the gymnastics?" (Gymnast 6) This point echoes the work of McMahon, Penney & Thompson (2012) in Australian swimming, where similarly, Australian swimming has been criticised for emphasising size rather than performance. This emphasis has been found to lead to a range of long-term eating disorders. The same gymnast spoke of this issue in Brazilian gymnastics as well:

In Brazil, you must be thin to be part of the national team, it happened to me, as I

was a bit over weight. It is not a norm, we see strong and stocky gymnasts in the USA and they are the best! Why in our country we should be always slim? Our gymnasts have eating disorders and eat what they want, I think it is wrong and coaches know that it is disturbing when you are overweight, but it is the same when you are underweight, maybe the last case even worse. (Gymnast 6).

Gymnast 6 refers to thinness as achieved by eating disorders being a greater problem than being overweight. Her view is backed up by some very successful international coaches from other countries, as detailed in Kerr et al. (2017) who noted the problem with the emphasis on thinness over health and like Gymnast 6, pointed to the immense success of the USA's WAG programme where the gymnasts tend to be muscular rather than thin. As Nunomura & Oliveira (2014) showed, the emphasis on thinness is particularly strong in Brazil due to the influence of immigrant Ukrainian and Russian coaches, who have advocated for thinness for many years.

These comments suggest that although the emphasis on difficulty in the Code of Points could potentially lead to an emphasis on thinness, in the Brazilian context the discourse of thinness is more likely to do the WAG Russian and Ukrainian-influenced culture. In the USA, the increased difficulty demands have instead led to the production of more muscular gymnasts, but this has not occurred in Brazil.

Artistry, Execution, and age

The majority of the participants in this study believed that the current rules favour mature and older gymnasts in terms of artistry, a finding which was also found in Kerr et. al (2016) in a sample of non-Brazilian gymnasts. Pointing to the value of artistry in the Code of Points, many saw this as an area where older gymnasts are advantaged. They described how gymnasts are better able to demonstrate the bodily expressiveness that comes with age and maturity, and this quality can

counterbalance the execution of fewer acrobatics and difficulties. For example:

The acrobatic gymnast will do well when she is younger. However, when ageing, the artistic expression can appeal. (Gymnast 3)

Younger gymnasts... have limited expression and their faces show anxiety in contrast with the older gymnasts who show intense sight and powerful eyes that favour artistry. (Coach 1)

I particularly like to watch older gymnasts; they have an advantage when we think of expression. On the other hand, the younger ones are robotic and less expressive. (Judge 4)

The artistic abilities of the gymnasts were believed to be of particular importance given the FIG's recent efforts to reform the Code of Points to more strongly reward artistry (Kerr and Obel, 2014). Two judges commented directly on this change:

For two cycles, the FIG is rating the artistry in order to bring back the femininity of gymnastics, because it was becoming too mechanical and hard. I believe it will be difficult for FIG to be able to devalue difficulty, as it is what catches attention, the first impact is difficult. Therefore, this scenario won't change, but they've been trying to value the artistry component... The new Code of Points requires interaction with audience and the press, in the past expression were more valued, the current Code of Points is trying to get the art back (Judge 2)

FIG tends to stimulate women on the stage, the art, the artistry, and not only acrobatics (Judge 1).

These changes to the Code of Points were argued to advantage older gymnasts. For example: "The current Code of Points values artistry, so it will be to the advantage of older gymnasts due to their expressivity and experience". (Judge 4) Another judge related this change more directly to gymnast longevity: "When there is valuing of artistic component, it tends to keep gymnasts on the scene." (Judge 1). Clearly this final judge believed that the

emphasis on artistry was effective for inspiring older gymnasts to continue competing.

Ever since the change to the open-ended Code of Points, there has been a gradual increase in execution deductions in order to prevent the situation of gymnasts with high difficulty but poor execution winning competitions (Kerr and Obel, 2014). Several of the participants commented that this change directly benefitted older gymnasts because older gymnasts are both stronger psychologically, due to greater international experience, and because they have been performing many of their skills for many years and so have consolidated their skills to a greater level than younger gymnasts:

Matured gymnasts have more control over their emotions and it counts much, the little ones have much to learn and experience ... We don't need to train that much every day ... You go to the gym and do what you have to do, don't need to stay 8 hours! It is all automatized and the body does by itself, it is all right! (Gymnast 6)

The superior psychology of older gymnasts was perceived to be a strength by several participants. For example, one judge described:

Older gymnasts can benefit from knowledge of their own strength points to perform well. They make fewer mistakes, they are more stable and very expressive, they face judging well, and therefore, they appeal during their performance. These are the older gymnasts' advantages. (Judge 4)

The ability to make few mistakes was considered to be important in the light of the Code of Points and the heavy deductions for execution. As one judge commented: "Do not include difficulties at the expense of execution because we judges are deducting the perfection! Judging is getting tense!" (Judge 1).

One gymnast linked these ideas together, arguing that judges expect older gymnasts to be more technically correct: "Judges associate maturity with technical quality" (Gymnast 3). The assumption here is that with age, gymnasts are able to

improve the technical aspects of their performance.

The gymnasts explained their ability to perform with less execution errors by discussing how as older gymnasts, they had increased knowledge about themselves and their abilities, which allowed them to be strong psychologically and make the most of their training time. This same finding was found by Barker-Ruchti et al. (2017).

For example, two gymnasts described: I'm more focused on my goals, I don't spend time, and I don't make the same mistakes as earlier. I have learned and mastered many skills. (Gymnast 2)

Mature gymnasts have more control that is emotional and it counts enormously, the little ones have much to learn and experience, then it is gratifying to see women in gymnastics. We don't need to train that much every day, it is a matter of mental preparation. You go to the gym and do what you have to do, don't need to stay 8 hours! It is all memorised and the body does by itself, it is all right! (Gymnast 6)

Both these gymnasts emphasised how after many years of training, their bodies were now able to automatically perform the correct movements without them having to think about it. Potentially, this then allows more artistry since they have the capacity to express themselves instead of only focusing the next movement. Consequently, they felt that they made less mistakes, and were also able to train more efficiently since their bodies did not need to continue to practice so many repetitions in order to compete successfully.

CONCLUSIONS

This study found that the changes to the Code of Points have been both positive and negative for older Brazilian WAG gymnasts. Although limited by its single country focus and small sample size, the findings have some similarities with other studies of older gymnasts. On the one hand, the increased difficulty demands are thought to advantage younger rather than older gymnasts. Also, these requirements

have, in the Brazilian context, been interpreted as a reason to reinforce the need for gymnasts to be thin. This is in contrast to studies in other countries (see Kerr et al., 2017), where coaches have been found to argue that the increased difficulty demands mean gymnasts need to be healthier to avoid injury, rather than thin. While the CoP itself does not advocate thinness, and nor is thinness on its own advantageous biomechanically (with the strength to weight ratio being the significant factor biomechanically), the cultural history of Ukrainian influence in Brazil has led to an association between increased difficulty and a strong emphasis on thinness. On the other hand, older gymnasts were felt to be advantaged due to being able to perform more artistically and with fewer mistakes, both of which have been found in previous studies using international samples (see for example, Barker-Ruchti et al., 2016; Kerr et al., 2016). Both these traits are important in the Code of Points because it aims to reward artistry and includes heavy deductions for execution errors.

With the actual open code system rewarding the key values of the sport', i.e., both difficulty and artistry, and promoting femininity and womanly bodies too, there is space for different bodies and ages to succeed in WAG. Further research would be of value examining the effects of the CoP on a range of different aged gymnasts and from a range of different countries.

REFERENCES

Anderson, V. (1997). Female Gymnasts: Older and Healthier. *The Physician and Sportsmedicine*, (3), 25.

Atikovic, A., Kalinski, S. D., Cuk, I. (2017). Age trends in artistic gymnastics across world championships and the Olympic Games from 2003 to 2016. *Science of Gymnastics*, 9(3), 251-263.

Barker-Ruchti, N. (2009). Ballerinas and pixies: A genealogy of the changing female gymnastics body. *International Journal of the History of Sport*, 26(1), 43-61.

Barker-Ruchti, N., Kerr, R., Schubring, A., Cervin, G., & Nunomura, M. (2017). Gymnasts are like wine, they get better with age': Becoming and developing adult women's artistic gymnasts. *Quest*, 69, 348-365.

Blue, A. (1987). *Grace Under Pressure: The emergence of women in sport*. London. Sidgwick and Jackson.

Braun, V., & Clarke, V. (2006) Using Thematic Analysis in Psychology, *Qualitative Research in Psychology*, 3(2), 77-101

Caine, D., Lewis, R., O'Connor, P., Howe, W., & Bass, S. (2001). Does gymnastics training inhibit growth of females?. *Clinical Journal of Sport Medicine*, 11(4), 260-270.

Cassas, K. J., & Cassetari-Wayhs, A. (2006). Childhood and adolescent sports-related overuse injuries. *American family physician*, 73(6), 1014-1022. Retrieved January 4, 2012, from <http://www.aafp.org/afp/2006/0315/p1014.html>

Cervin, G. (2017). *A Balance of Power: Women's Artistic Gymnastics During the Cold War and Its Aftermath* (Doctoral dissertation, PhD thesis, University of Western Australia).

Cervin G. (2016). Gymnasts are Not Merely Circus Phenomena: Influences on the Development of Women's Artistic Gymnastics During the 1970s. *The International Journal of the History of Sport*, 32(16), 1929-1946.

Claessens, A. L., Lefevre, J., Beunen, G. P., & Malina, R. M. (2006). Maturity-Associated Variation In The Body Size And Proportions Of Elite Female Gymnasts 14-17 Years Of Age. *European Journal Of Pediatrics*, 165(3), 186-92.

Daly, R.M., Bass, S.L. & Finch, C.F. (2001). Balancing the risk of injury to gymnasts: how effective are the counter measures?. *British Journal of Sports Medicine*, 35(1), 8-19.

Denzin, N., & Lincoln, Y. (2005). *The Sage handbook of qualitative research*. Thousand Oaks: Sage.

Dionigi, R. (2006). Competitive Sport and Aging: The Need for Qualitative Sociological Research. *Journal of Aging and Physical Activity*, 14(4), 365-379.

Douglas, J. (1985). *Creative interviewing*. Beverly Hills: Sage Publications.

Dresler, C. M., Forbes, K., O'Connor, P. J., Lewis, R. D., Glueck, M. A., Tofler, I. R., et al. (1997). Physical and emotional problems of elite female gymnasts. *New England Journal of Medicine*, 336, 140 - 142.

FIG (2018). *Medical Articles*. Retrieved on <http://www.fig-gymnastics.com/site/page/view?id=372>.

FIMS/WHO Ad Hoc Committee on Sports and Children. (1998). Sports and children: Consensus statement on organized sports for children. *Bulletin of the World Health Organization*, 76, 445-447.

Flick, U. (2005). *Qualitative Sozialforschung: Eine Einführung*. Reinbek: Rowohlt.

Kerr, R. (2006). The impact of Nadia Comaneci on the sport of women's artistic gymnastics. *Sporting Traditions*, 23(1), 87-102.

Kerr, R., Barker-Ruchti, N., Nunomura, M., Cervin, G., & Schubring, A. (2016). The Role of Setting in the Field: The Positioning of Older Bodies in the Field of Elite Women's Gymnastics. *Sociology*, 1-17.

Kerr, R., Barker-Ruchti, N., Schubring, A., Cervin, G., & Nunomura, M. (2013). *Coming of Age: Towards Best Practice in Women's Artistic Gymnastics*. Lincoln University.

Kerr, R., & Obel, C. (2014). The disappearance of the perfect 10: evaluating rule changes in Women's Artistic Gymnastics. *The International Journal of the History of Sport*, 32(2), 318-331.

Kerr, R.; Barker-Ruchti, N.; Schubring, A.; Cervin, G. & Nunomura, M. (2017). Coming of age: coaches transforming the pixie style model of coaching in women's artistic gymnastics. *Sports Coaching Review*.

Lavallee, D., & Robinson, H. K. (2007). In pursuit of an identity: A qualitative exploration of retirement from women's artistic gymnastics. *Psychology of Sport and Exercise*, 8(1), 119-141.

Leglise, M. (2007). The numbers speak for themselves. *Moutier: FIG*.

Leglise, M. (1996). Children and high-level sport. *Olympic Review*, 7(25), 52-5.

Leglise, M. (1998). Limits on young gymnasts' involvement in high-level sport. *Technique*, 18(4), 8-14.

Lindholm, C., Hagenfeldt, K., & Hagmann, U. (1995). A nutrition study in juvenile elite gymnasts. *Acta Paediatrica*, 84(3), 273-277.

MacMahon, J.; Penney, D. & Thompson, M.D. (2012). Body practices—exposure and effect of a sporting culture?' Stories from three Australian swimmers. *Sport, Education and Society*, 17(2), 181-206.

Martinsen, M., Bratland-Sanda, S., Eriksson, A. K., & Sundgot-Borgen, J. (2010). Dieting to win or to be thin? A study of dieting and disordered eating among adolescent elite athletes and non-athlete controls. *British Journal of Sports Medicine*, 44(1), 70-76.

Mellerowicz, H., Matussek, S., Leier, T., & Asamoah, V. (2000). Sportverletzungen und Sportschäden im Kindes- und Jugendalter - eine Übersicht. *Deutsche Zeitschrift für Sportmedizin*, 51(3), 78-84.

Miethling, W.D., & Krieger, C. (2004). Schüler im Sportunterricht. *Schorndorf: Hofmann*.

Nunomura, M., & Oliveira, M.S. (2014). Talent detection and selection in Women's Artistic Gymnastics: the Brazilian coaches' perspective. *Brazilian Journal of Sports Science*, 36(2); 311-325.

Oliveira, M.S., Pires, F.R., Roble, O., Molinari, C.I., & Nunomura, M. (2017). Understanding and evaluation of the artistic and aesthetic components in artistic gymnastics. *Revista Brasileira de Educação Física E Esporte*, 10(1), 41-50.

Ryan, J. (1995). Little girls in pretty boxes: The making and breaking of elite

gymnasts and figure skaters. New York: Warner.

Sands, W. (2018). Historical Changes in Height, Mass, and Age of USA Women's Olympic Gymnastics Team: An Update. *Science of Gymnastics*, 10 (3), 391-399.

Schubring, A., Barker-Ruchti, N., Kerr, R., Cervin, G., Nunomura, M. (2019). 'Gymnastics is not everything'. Maintaining a dual career horizon in women's artistic gymnastics. In Barker-Ruchti, N. (ed.). *Athlete learning in elite sport*. London: Routledge.

Tofler, I. R., Stryer, B.K., & Micheli, L.J. (1996). Physical and emotional problems of elite female gymnasts. *New England Journal of Medicine*, 335(4), 281 - 283.

Tulle, E. (2008). The Ageing Body and the Ontology of Ageing: Athletic Competence in Later Life. *Body and Society*, 14(3), 1 - 19.

ACKNOWLEDGEMENT

This study was supported by the São Paulo Research Foundation (FAPESP).

Corresponding author:

Dr. Myrian Nunomura
Avenida dos Bandeirantes 3900
Ribeirão Preto
São Paulo
Brazil
Phone: +55 16 33150344
E-mail: mnunomur@usp.br