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SYSTEMATIC REVIEW

Technical elements on the rings in men's artistic gymnastics—a systematic review

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Abstract

Although rings can move freely in all possible directions, by which they differ from all other apparatuses, physical performance at highest level is essetial in men's artistic gymnastics to fulfill the exercise's technical requirements in the interest of effective and accurate performance. We have aimed to compile the scientific evidence regarding exercises on the rings in men's artistic gymnastics and, based on it, to investigate the necessary requirements for their successful realization. In regard to Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines, the database search (Google Scholar, PubMed, Web of Science and Research Gate) has identified 5759 potential studies. Original cross-sectional studies published between 2000 and 2022 written in English, active male gymnasts who do not suffer from injury as a sample of participants, and studies that have evaluated different types of elements on the rings were reconsidered. Lastly, 15 full-text studies were identified. A total of seven elements were evaluated, four strength elements (swallow, Azarian, iron cross and support scale), two dismounts (double backflip straight and double backflip straight with a 360° turn), and one swing element (backward giant swing). Two studies have conducted a dismount kinematic analysis, another four strength elements electromyography, while two studies have used force plates to evaluate the required specific strength for their successful performance. Hence, handgrip strength, pectoralis muscles, teres major, deltoids and serratus anterior are crucial. In addition, handgrip strength, proper swing movement, lateral arm movement during the descending phase, and hip flexor/extensor muscle activity are also essential for both giant swings and dismounts. Progressive strength upgrade of key movements in younger gymnasts is necessary to make successful generations on the rings. Therefore, in order to upgrade the above, researchers and scientists should discover a method for providing more relevant and updated information for practitioners, *i.e.*, coaches and gymnasts.

Keywords

Rings; Men's artistic gymnastics; Strength; Swing; Dismount

1. Introduction

For successful performances, artistic gymnastics necessitates a considerable standard of anaerobic capacity, as well as flexibility qualities [1]. According to several authors [2–5], this sport promotes jumping, explosive power, pushing and pulling abilities, stability and aesthetics development. The performance itself is determined by the optimal trade-off between physical fitness and extensive technical abilities, that are required on each apparatus [6]. Thus, in order to meet the technical standards, a greater fitness level is required [7]. More precisely, some authors [8, 9] are emphasizing that increased stamina, elasticity and synergy levels are in the interest of effective and accurate element performance.

In artistic gymnastics, rings differ from all other apparatuses by their consistent concentric and eccentric muscular engagements [10]. The rings can move freely in all possible directions, adding more considerable instability and difficulty to the elements. Hence, the ring's elements are distinguished by technique, compared to other apparatuses. As a result, gymnasts must pay attention to both individual limb movement and rings deviation at the same time [11].

Costill *et al*. [12] focuses their attention on unique training realization in elite athletes, in order to reach optimal performance. In artistic gymnastics, coaches with their gymnast must improve the technique and the acquisition of more difficult skills, along with physical prerequisites. Hence, these two components must be developed simultaneously, especially in the preparatory phase, allowing gymnasts to improve their sport-specific performance [13]. At competitions, gymnasts perform 9 elements, with dismount being the last, to increase the D score as much as possible. In other words, by the Federation Internationale de Gymnastique (FIG) Code of Points [14, 15], the exercises on the rings consist of kip and swing elements and swings through or to handstand (2 s), strength elements and hold elements (2 s), swings to strength hold elements (2 s) and dismounts.

Only two studies [16, 17] have reviewed the studies that concerned men's artistic gymnastics. Prassas & Sanders [16] dealt with kinematic and kinetic profiles of straight arms in giant swings, their optimized solutions, along with stretched double-felge backward to forward swing in hang (so-called "O'Neil") and twisting techniques of dismounts. In another study by Prassas, Kwon & Sands [17], it was concluded that biomechanical studies in artistic gymnastics had grown in number; however, most of them were focused on generalization.

According to the author's knowledge, there are no systematic reviews of recent date that summarize and examine previous studies of exercises on the rings in men's artistic gymnastics and investigate mandatory requirements for the successful realization of the element. Hence, we have aimed to compile the scientific evidence regarding exercises on the rings in men's artistic gymnastics and, based on it, investigate the necessary requirements for their successful realization.

2. Materials and methods

2.1 Study identification

This study has followed the PRISMA recommendations [18, 19]. Searches in the relevant electronic databases, such as Google Scholar, PubMed, Web of Science and Research Gate, were conducted using the following keywords: ("exercise" OR "training" AND "rings" OR "strength" OR "static" OR "swing" OR "dismount" OR "movement" AND "gymnastics" OR "artistic gymnastics" OR "men's artistic gymnastics").

The gathered data was examined using a descriptive approach, and all abstracts and titles were reviewed for potential inclusion. Following a thorough selection procedure, studies were deemed relevant if they matched the inclusion criteria. Three writers completed the study search, value evaluation and data extraction separately. Furthermore, additional references list from previously evaluated and original research was also examined. The authors then cross-examined the identified studies, which were either accepted for further investigation or excluded.

2.2 Inclusion criteria

Inclusion criteria were defined: original scientific study, cross-sectional study, study published between 2000 and 2022, study written in English, active male gymnasts who do not suffer from injury as a sample of participants, and studies that have evaluated different types of elements on the rings.

2.3 Exclusion criteria

Following the inclusion criteria, the exclusion criteria were also defined: published studies before 2000, authored in languages other than English, women's artistic gymnastics, other types of gymnastics or studies that evaluated elements on different apparatuses. Likewise, editorials, health concepts, reliability and validity of judging studies, and historical evaluation studies were also considered for exclusion.

2.4 Risk of bias assessment

Using the recommendations of Physiotherapy Evidence Database (PEDro scale), bias risk was conducted, in order to determine the quality of studies [20]. It is a reliable indicator of clinical trials' methodological integrity. It is also a legitimate method for adding scale item scores to get the total score, which may be considered as an interval-level measure and submitted to parametric statistical analysis. Two independent reviewers have used checklists to assess the quality and risk of bias. Concordance among reviewers was also calculated using k-statistics data to review the complete text and assess relativity and risk of bias. In the case of disagreement, the gathered data was evaluated and included/excluded by a competent third reviewer. The k-rate of agreement among reviewer results was $k = 0.91$.

2.5 Data extraction

The necessary information was retrieved after the cross-examination and only if the data was satisfactory. To extract the necessary, such as first author and year of publication, study aim, sample size, age, competition level, information about the evaluated element on rings, and results obtained, the standardized data extraction protocol (Cochrane Consumers and Communication Review Group') was used.

3. Results

3.1 Characteristics and selection of studies

Electronic database search and scanning of the lists of references yielded 5759 papers. After removing duplicates, 5021 studies were screened. Following the inclusion criteria, 4980 papers were excluded. Furthermore, another 26 studies with non-relevant outcomes, editorials, health concepts, reliability and validity of judging studies, and historical evaluation studies were additionally excluded. Lastly, 15 full-text studies were included in the systematic review (Fig. 1).

There was a total of 292 male participants. The youngest participants were 14 years old [21], the oldest was 30 years old [10], and there were a group of studies that did not present the sample age [22–27]. The study with the highest participant number was 212 [23], while the lowest was only 1 participant in several studies [23, 25, 27, 28].

Giant swing backward, as the only examined swing element on rings, was discussed by three studies [25–27], while nine studies investigated different strength elements, such as swallow [10, 23, 24, 29–32], Azarian [33], iron cross [21, 29, 30, 34] and support scale [29, 30]. Kolimechkov *et al.* [22] examined both the double backflip straight with a 360° turn

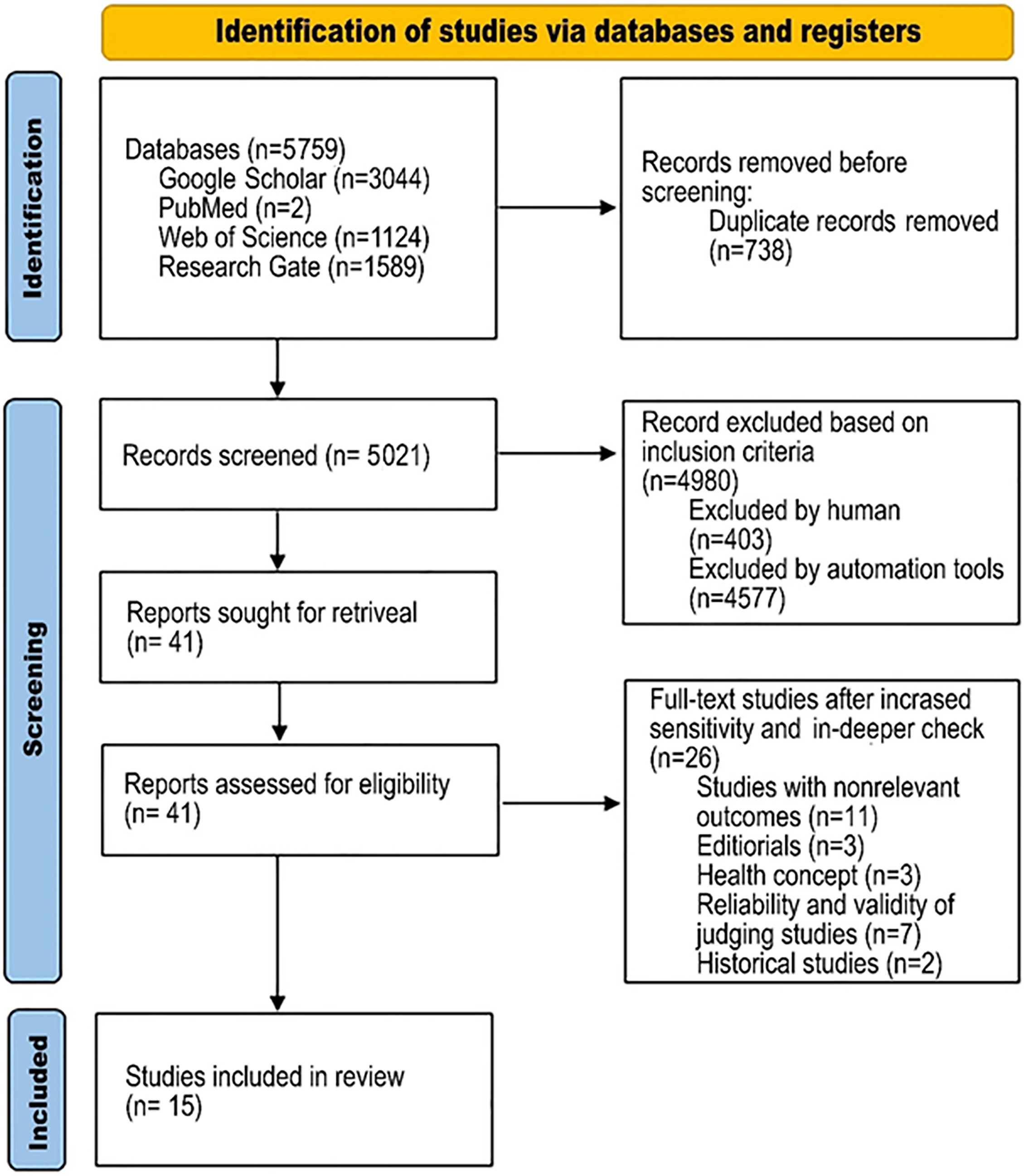

FIGURE 1. Study identification based on pre-defined criteria (PRISMA flow chart).

and double backflip straight, while Ningxiang *et al.* [28] only investigated double backflip straight with a 360° turn. Four studies conducted electromyography of muscle activation on strength elements, such as iron cross [34], swallow [24, 32] and Azarian [33]. In contrast, two studies used force plates to evaluate the required specific strength for the successful performance of the iron cross [21] and swallow [31].

Table 1 shows the final included studies in the systematic review in more detail.

3.2 Quality of studies

The final quality assessment scores were calculated using the earned points on the PEDro scale. According to Maher *et al.* [35], the study will be clasified as "poor" if the study earnes 0–3 points, "fair" 4–5 points, "good" 6–8 points, and "excellent" 9–10 points. In our case, a total of 12 studies have presented fair quality, while the remaining three have presented good quality (Table 2).

4. Discussion

We have aimed to compile the scientific evidence regarding exercises on the rings in men's artistic gymnastics and, based on it, investigate the necessary requirements for their successful realization. As far as the main study findings, we have identified that for successful strength elements realization, handgrip strength, pectoralis muscles, teres major, deltoids and serratus anterior are crucial. In contrast, handgrip strength, proper swing movement, lateral arm movement during the descending phase, and hip flexor/extensor muscle activity at

TABLE 1. Review of studies.

First Author and Year of Publication	Study Aim	Sample of participants		Element Evaluation	Result
		Number	Age (yr)		
Bernasconi *et al.* [34] (2004)	To compare MA and coordination during IC on R and H and to determine whether H usage induced functional adaptations of shoulder muscles	N-6	23 ± 3	IC (EMG)	Normalized RMS R 10.024 ± 1.488* H 7.976 ± 0.896*
Bernasconi *et al.* [33] (2006)	To compare the activity of 11 shoulder muscles during AZ when gymnasts used B and H	N-7	21–26	AZ (EMG)	RMS (B) > RMS (H)*
Bernasconi *et al.* [32] (2009)	To determine the activity of 8 shoulder muscles during S, and to compare the muscle activity and coordination between S and 3 training movements	N-6	22 ± 3	S (EMG)	Compared to S (R), pectoralis major participates less in shoulder flexion during the counterweight exercise, while deltoid is more activated during dumbbells exercise ($p < 0.05$). Barbell exercise reduces the participation of serratus anterior in stabilizing the scapula ($p < 0.05$)
Campos *et al.* [24] (2011)	To characterize S in order to identify the MA of different muscles to create strategies of progression to learn this skill	N-1	/	S (EMG)	Stabilizing shoulder joint, infraspinatus (69.3%), serratus anterior (53.3%), and trapezius inferior (45.1%) should be activated during S
Dunlavy *et al.* [21] (2007)	To determine if FP placed on supports to simulate an IC position could demonstrate the fidelity necessary to differentiate between athletes who could perform IC from those who could not	N-10 P-5 NP-5	P-23.8 ± 1.3 NP-14 ± 1	IC (FP)	The sum of mean arm forces P-654.7 ± 35.4 ($p = 0.007$) NP: 306 ± 201.4 The sum of peak arm forces P: 676 ± 41.5 ($p = 0.005$) NP: 330.3 ± 213.5
Bango *et al.* [31] (2013)	To develop a tool for measuring Sstr production of the gymnast performing S using a single FP	N-8 P-4 NP-4	P-24 ± 3.6 NP-17 ± 1.2	S (FP)	P, NP* ICC MxIF − ARF (N): 0.993 MxIF − %RF (%): 0.998 MxIF − RRF (N·kg^{-1}): 0.988 MnIF − ARF (N): 0.995 MnIF − %RF (%): 0.992 MnIF − RRF (N·kg^{-1}): 0.992 CV_{SEM}(%) MxIF − ARF (N): 3.82 MxIF − %RF (%): 3.14 MxIF − RRF (N·kg^{-1}): 3.14 MnIF − ARF (N): 4.00 MnIF − %RF (%): 3.24 MnIF − RRF (N·kg^{-1}): 3.24

TABLE 1. Continued.

First Author and Year of Publication	Study Aim	Sample of participants		Element Evaluation	Result
		Number	Age (yr)		
Campos *et al.* [23] (2009)	Verifying the contribution of S as a structural framework and to evaluate it within R routines	N-212	/	S	41% of total competitors presented S 56% included at least one S (119 gymnasts) 119 gymnasts (73% of them) made two variants of S
Gorosito [10] (2013)	To analyze the correlation between gymnasts Rstr and the time in seconds that gymnasts can hold S and to identify minimum Rstr required for proper execution	N-14	18–30	S	+ Rstr and holding S ($r = 0.952$, $p < 0.001$). Body structure (height, sitting height and wingspan) is not an important factor for the proper execution of S
Hubner & Scharer [30] (2015)	To investigate the correlation between strength in seven preconditioning exercises and performance of S, IC and SS	N-10	21.5 ± 2.5	S, IC, SS	+ S with preconditioning S supine position ($r = 0.71$, $p = 0.031$) and BP ($r = 0.71$, $p = 0.046$) + SS and S supine position ($r = 0.69$, $p = 0.039$ + IC with IC-B ($r = 0.66$, $p = 0.051$) and BP ($r = 0.67$, $p = 0.069$)
Scharer & Hubner [29] (2016)	To determine MX in terms of counterweight or additional weight, at different holding times based on the MX of S, IC and SS	N-10	21.5 ± 2.5	S, IC, SS	*↓ in MX as holding time increases (*t*-test: $p < 0.001$)
Brewin *et al.* [27] (2000)	To investigate the contributions of apparatus and gymnasts El and technique to minimize peak force at shoulders during BGS	N-1	/	BGS	Gymnast and apparatus contribute to minimizing peak shoulder force. The contribution of gymnast's technique is considerably greater
Sprigings *et al.* [26] (2000)	Objective information on the role of flexor/extensor of the hip and shoulder joints during BGS and to examine the timing strategy to reduce ReSw in a held handstand by doing BGS	N-2	/	BGS	Shoulder flexors/extensors are the main source of energy generation. Gymnast performed from initial 16° to 6–7.5° of ReSw
Yeadon & Brewin [25] (2003)	Can ReSw be reduced to 0° using a detailed simulation model, and what are the practical limits?	N-1	/	BGS	Gymnast performed from initial 2.1° to 0.8° of ReSw. The optimal body configuration must be timed within 15 milliseconds

TABLE 1. Continued.

First Author and Year of Publication	Study Aim	Sample of participants		Element Evaluation	Result
		Number	Age (yr)		
Ningxiang *et al.* [28] (2012)	KinA and apparatus features after D (dbfs 360°)	N-1	27	D (dbfs 360°)	D realization dbfs: 1.6 s dbfs360°: 1.6 s Vertical distance: 3.33 m 0–90° 0.2 s (7.58 rad/s) 0–180° 0.12 s (13.08 rad/s) 80–270° 0.16 s (9.81 rad/s) 70–360° 0.2 s (7.58 rad/s)
Kolimechkov [22] (2021)	To conduct a KinA of dbfs and dbfs 360°	N-2	/	D (dbfs, dbfs 360°)	Ankle speed 1 gymnast: 11.11 m/s 2 gymnasts: 11.29 m/s Angular velocity 1 gymnast: 10.0 rad/s 2 gymnasts: 9.05 rad/s

*Legend: N: total number of participants; P: performers; NP: non performers; BGS: backward giant swing; EMG: electromyography; IC: iron cross; RMS: root-mean-square value; S: swallow; SS: support scale; AZ: Azarian; D: dismount; dbfs: double backflip straight; dbfs 360°: double backflip straight with a 360° turn; El: elasticity; ReSw: residual swing; KinA: kinematic analysis; Sstr: specific strength; Rstr: relative strength; R: rings; H: herdos; B: belt; MX: maximal resistance; MA: muscle activity; FP: force platform; ICC: intra-class correlation coefficient; CV_{sem}: coefficient of variation of the standard error of measurement; BP: bench press; MxIF − ARF: maximal isometric force − absolute released force; MxIF − %RF: maximal isometric force − percentage of released force; MxIF − RRF: maximal isometric force − relative released force; MnIF − ARF: mean isometric force − absolute released force; MnIF − %RF: mean isometric force − percentage of released force; MnIF − RRF: mean isometric force − relative released force; *: significant difference between groups ($p > 0.05$); *↓: significant decrease; +: significant positive correlation.*

TABLE 2. PEDro scale result.

	Criterion											
Study	1	2	3	4	5	6	7	8	9	10	11	∑
Bernasconi *et al.* [34] (2004)	Y	N	N	Y	N	N	N	Y	Y	Y	Y	5
Bernasconi *et al.* [33] (2006)	Y	N	N	Y	N	N	N	Y	Y	Y	N	4
Bernasconi *et al.* [32] (2009)	Y	N	N	N	N	N	N	Y	Y	Y	Y	4
Campos *et al.* [24] (2011)	Y	N	N	N	N	N	N	Y	Y	Y	Y	4
Dunlavy *et al.* [21] (2007)	Y	N	N	N	N	N	Y	Y	Y	Y	Y	5
Bango *et al.* [31] (2013)	Y	N	N	N	N	N	Y	Y	Y	Y	Y	5
Campos *et al.* [23] (2009)	Y	N	Y	Y	Y	N	N	Y	Y	Y	Y	7
Gorosito [10] (2013)	Y	N	N	N	N	N	Y	Y	Y	Y	Y	5
Hubner & Scharer [30] (2015)	Y	N	N	Y	N	Y	N	Y	Y	Y	Y	6
Scharer & Hubner [29] (2016)	Y	N	N	Y	N	Y	N	Y	Y	Y	Y	6
Brewin *et al.* [27] (2000)	Y	N	N	N	N	N	N	Y	Y	Y	Y	4
Sprigings *et al.* [26] (2000)	Y	N	N	Y	N	N	N	Y	Y	Y	Y	5
Yeadon & Brewin [25] (2003)	Y	N	N	N	N	N	N	Y	Y	Y	Y	4
Ningxiang *et al.* [28] (2012)	Y	N	N	N	N	N	N	Y	Y	Y	Y	4
Kolimechkov [22] (2021)	Y	N	N	Y	N	N	N	Y	Y	Y	Y	5

Legend: 1: eligibility criteria; 2: random allocation; 3: concealed allocation; 4: baseline comparability; 5: blind subject; 6: blind clinician; 7: blind assessor; 8: adequate follow-up; 9: intention-to-treat analysis; 10: between-group analysis; 11: point estimates and variability; Y: criterion is satisfied; N: criterion is not satisfied; ∑: total awarded points.

the right time are essential for both giant swings and dismounts.

Due to the decelerating muscle effort involved to resist gravity while maintaining static positions, sustaining a static strength element on rings may be considered an eccentric muscle contraction. For this reason, a high level of upper limb relative maximal strength and sophisticated balancing abilities in holding positions are required for the gymnast to complete these types of movements [21, 29, 31]. Most of these skills are relatively slow-moving or held (*i.e.*, isometric), occur in extraordinary postures, and require months or even years to evolve. Scharer & Hubner [29] have identified significant decreases in maximal resistance as the time in the holding element increases. This result is in line with the findings by Komimura & Ikuta [36], who have found a gradual decrease in maximal isometric grip strength ratios every second. This can also be explained by the high intensity of maintaining a static element [37]. Hubner & Scharer [30] have found that preconditioning exercises, iron cross with belt, and bench press positively correlate (r = 0.66, p = 0.051; r = 0.67, p = 0.069, respectively) with iron cross on the rings. These results are in accordance with the results presented by some other authors [38, 39], who have observed a significant improvement of the iron cross specific maximal resistance if the hold element is trained at 90% of maximum intensity. Meanwhile, Bernasconi *et al.* [33, 34] have shown that conducting preconditioning exercises on herdos, iron cross or Azarian, do not provide same shoulder coordination and activation as on the actual rings or belt. Hubner & Scharer [30] have also identified that preconditioning exercises, swallow in supine position, and bench press positively correlate (r = 0.71, p = 0.031; r = 0.71, p = 0.046, respectively) with swallow on rings. In addition, swallow in supine position, as a preconditioning exercise, also positively correlates (r = 0.69; p = 0.039) with support scale on the rings. These findings are in line with some previously reported studies [40, 41], which have identified higher predictability of 1RM from lower repetition maximum testing than from 10 or more repetitions. Campos *et al.* [24] emphasize that infraspinatus (69.3%), serratus anterior (53.3%), and trapezius inferior (45.1%) should be activated the most during a swallow. Furthermore, according to Gorosito [10], in order to perform a valid swallow or even support scale on the rings, a gymnast should be able to hold at least 30% of his body weight on each hand in preconditioning exercises in the supine position. However, based on the fact that swallow and support scale have very similar performance, as well as the Azarian with iron cross, pectoralis muscles, teres major, deltoids and serratus anterior, as well as handgrip strength, are of great importance for proper holding of the static position of the above elements on the rings.

The backward giant swing is frequently used as a link between two obligatory held handstands [42]. According to Yeadon & Brewin [25], the ability to perform a giant swing to a stationary handstand position is of great importance to elite gymnasts. Two decades ago, a gymnast had to realize both backward and forward giant swings held in a stationary handstand position. Today, a gymnast can realize one of the mentioned swinging elements, depending on the gymnast's individual predisposition [15]. Brewin *et al.* [27] have shown that increasing apparatus elasticity produces only a small reduction in peak force at the shoulders. Since this study was conducted more than two decades ago, various manufacturers of new apparatus types have appeared, such as American Athletic, Continental Sports, Gymnova, Spieth, Senoh, Taishan *etc.* [15]. However, further research is needed to examine the shoulder's peak force on giant swing at different types of apparatuses.

Sprigings *et al.* [26] and Yeadon & Brewin [25] have tried to analyze and minimize residual swing after performing a giant swing. The results have shown initial 16° and 2.1° to final 7.5° and 0.8°, respectively. In practice, in order to successfully make a giant swing to stationary handstand, six factors should be taken into consideration. First, a stable handstand should be provided; second, the lateral movement of the rings at the initial handstand descending phase; third, the active role of shoulder joint flexors in pushing the rings backwards shortly after the bottom swing arc. The fourth is the hip extensor muscle activity, as the legs swung upwards past the horizontal; the gymnast power profile is the fifth factor, and the performance technique is the sixth [26]. Although training modalities may differ from coach to coach, these factors may provide more opportunities for the gymnast to perform the task properly and successfully.

The final element on the rings is dismount, and in many competitions, it is a crucial skill for grading the rings routine [22]. Between 2000 and 2019, in 15 Worlds Championships and 5 Olympic Games, 75% of the 62 medalists performed either the double back straight somersault or the same with a full twist [22]. Since the gymnasts' body mass multiplies several times while tumbling and dismounting, Nissinen [43] have found that peak combined tension measured in the ring cables reaches up to 9 time the gymnast's body weight, whereas Čuk [44] has identified that recorded loads were over 13 G on the hands. Further, the lateral arm movement during the handstand descending phase may minimize the shoulder force, which will reduce the risk of damaging ligaments and muscles. The bending (arching) must be at certain degrees since the body movement depends on individual gymnast's capabilities [22, 27]. Both included studies [22, 28] have shown similar results between gymnast dismounts, such as performing time (2.48 s *vs.* 2.3 s, respectively), lateral movement of arms in handstand descending phase and straight body with hands close to the body, in order to speed up the rotation needed for the twist around the longitudinal axes. Based on the authors' experience, there are no other conducted studies to compare the results with, so this requires further research in the future.

Teaching progressions on any element must be followed by basic pedagogic concepts, so that each progressing stage includes a movement structure similar to the desired element [45], which refers to the main practical applicability. As far as the main study limitation, authors did not have unlimited approach to some on-line archives, so only databases to which authors had total access were observed. Hence, there were no many included studies from only four databases. But even if we had set some other inclusion/exclusion criteria, such as elite sample or training experience/competition, the number of included studies would still be small.

5. Conclusion

Having in mind the originality and creativity of both gymnasts and coaches, the ability to upgrade the elements has been widely expanded in previous years. Hence, this systematic review has a dual meaning. First, it can help coaches in progressive strength upgrade of key elements in their younger generation gymnasts to make successful generations of gymnasts on the rings. As an upgrade to the first, the second meaning applies to researchers and scientists, who should discover a method for providing more relevant and updated information for practitioners, *i.e.*, coaches and gymnasts. As a result, our awareness of the sport's fundamentals and foundations seems to be limited, with gaps in knowledge about technique attributes that can improve performance. Consequently, this review began with an attempt to identify key performance factors that contribute to superior performance.

Therefore, in order to upgrade the above, researchers and scientists should discover a method for providing more relevant and updated information for practitioners, *i.e.*, coaches and gymnasts.

AVAILABILITY OF DATA AND MATERIALS

All data presented in this study are contained within this article.

AUTHOR CONTRIBUTIONS

DĐ, MP, SV, PV and MS—conceptualization, resources; LP and GS—methodology, writing-review and editing; DR and RM—software; IJ and DM—validation; LP, RM and DM—formal analysis; GS and DR—investigation; GS—data curation, supervision, project administration; IJ—writing-original draft preparation; DR—visualization. All authors have read and agreed to the published version of the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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