THE RELATIONSHIP BETWEEN WOMEN´S ARTISTIC GYMNASTICS TECHNICAL SKILL, PHYSICAL PERFORMANCE TEST RESULTS AND SUCCESS IN COMPETITIONS IN FINLAND

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Abstract

The aim of this study was to find out the potential of the Minoritest to identify the most likely talented gymnasts to join the national team pre-training group in Finland. The study examined the relationships between gymnasts´ (N=215, age 10–13) Minoritest results (2006–2010) and success in competitions after the Minoritests until the end of 2016. The competition results were also compared between the gymnasts who had participated in the test and a random number (N=180) of gymnasts who had not. According to this study, the majority (92%) of the best gymnasts in competitions had participated in the Minoritest. 39% of the best in competitions were among the top 10 in the Minoritest. The test results from the technical skills showed a significant connection to the average competition results in all age groups and to the average competition level in the 10–12-year-olds. The test results of the flexibility section did not show relation to competition success. The test results of the strength section showed a significant connection to the average competition results and to the average competition level in the 10–11-year-olds. In the 12–13-year-olds the test results of the strength section showed a relation to the average competition level. According to this study Minoritest success have a positive connection to the future competition success. However, the relation cannot be considered unequivocal. The test results of the strength section can be considered a significant section for the 10–11-year-olds to predict future potential to succeed.

Keywords: *Women´s artistic gymnastics, talent identification, technical skills, physical performance, competition success.*

INTRODUCTION

In women´s gymnastics the training is typically started at about the age of five and the high intensity of training is maintained through the growth (Arkaev & Suchilin, 2004; Armstrong & Sharp 2013; Sands, 2000). It takes about 10 years of intensive training to achieve the elite level in women´s gymnastics (Arkaev & Suchilin, 2004; Armstrong & Sharp, 2013; Sands, 2000). Because training is started at early childhood and the elite level is reached at middle to late adolescence, a talented gymnast must be identified earlier than in many other sports. Without early talent identification gymnasts might be excluded from the buoyant training and may not have the time required to reach the top level during the career. Talent

identification at an early stage is important also to ensure gymnast´s motivation. (Prescott, 1999.)

There is no uniform world wide test for the identification of a potential gymnast. Each country has their own tests for talent identification which are, however, very much alike and include different kinds of measures of gymnast´s physical fitness and technical skills (Bale & Goodway, 1990; Jemni, 2011). The importance of physical, anthropometric and motor characteristics have been highlighted in the talent identification (e.g., Bale & Goodway, 1990; Pion, et al, 2014; Prescott, 1999). However, comparison of these different characteristics has been shown to produce varying data (Pion, Hohmann, Liu, Lenoir & Segers, 2017). In addition, each apparatus has its own key elements for a successful performance. There is also a considerable variability in the ability of gymnasts to perform in different apparatuses. (Bradshaw & Le Rossignol, 2004).

To understand the physiological conditions of gymnast´s early adolescence, it is necessary to take into account the gymnast´s age, growth and maturation (individual timing and tempo of puberty) (Armstrong & Barker, 2012; Armstrong, Welsman & Chia, 2001; Armstrong & Sharp, 2013; Brown, Patel & Darmawan, 2017; Mountjoy, 2008; Van Praagh & Dore, 2002). The stage at which the gymnast´s growth is, affects the gymnast´s physical performance (Brown et al., 2017; Rowland, 2005). Aerobic and anaerobic fitness as well as muscle strength develop with the growth (Goswami, Singha Roy, Dalui & Bandyopadhyay, 2014; Rowland, 2005) and especially during puberty (Beunen & Thomis, 2000; Geithner et al., 2004; Van Praagh, 2000). Increase in the size of the body or its body parts is the most important factor affecting physical performance. The development of physical performance, especially anaerobic fitness and muscle strength, is also influenced by other factors independent of the body size, which explains why gymnasts of the same size do not have the same level of physical performance. Such size-independent factors include e.g. functioning of the nervous system (recruitment, coordination) and the organization of the muscle fibers. (Rowland, 2005.)

Talent identification with an individual test is difficult because of the multidimensional nature of gymnastics, gymnast´s individual growth and differences in coaching (Pion, Lenoir, Vandorpe & Segers, 2015; Pion, et al, 2017; Prescott, 1999; Sands, 2003; Vayens, Lenoir, Williams & Philippaerts, 2008). The weaknesses in predicting future performance by a single test are that the performance tests are testing only a few characteristics at a time and that the evaluation is strongly governed by the gymnast´s current physical and technical skill level (Vayens, et al, 2008). It is often assumed that the child´s physical performance and characteristics are in linear relation to adult´s ones (Morris, 2000; Vayens, et al., 2008). The problem in selection processes is also the high dropout rate of gymnasts (Pion & al. 2015) due to various reasons (Crane & Temple, 2015). In Finland, majority of gymnasts quit gymnastics during the 11-15 years of age (Lämsä & Mäenpää, 2002). In the talent identification it would be important to understand and identify the factors that influence the development of a gymnast, and to assess the development of talent characteristics, motor learning and the ability to develop performance in the long term (Di Cagno, et al, 2014; Pion, et al, 2015; Prescott, 1999; Vayens, et al, 2008).

Minoritest is an annual test camp for female gymnasts in Finland where the gymnasts are selected for the Finnish national team pre-training group. All the 10–13-year-old gymnasts that have fulfilled the requirements of reaching the minimum competition score in the minimum competition level and completing successfully a certain performance badge, are able to participate

in the Minoritest. Participation in the test is optional. The test is based on FIG Age Group Development and Competition Program and consists of various technical skill and physical performance test exercises. The technical skill section consists of different kinds of individual movements and their combinations on each apparatus testing the gymnasts´ specific technical prerequisites. The flexibility section consists of exercises that are designed to measure the gymnasts´ shoulder and hip flexibility. The strength section tests the gymnasts´ explosive power, speed, agility and specific strength-resistance characteristics with various static and dynamic exercises. The gymnasts are divided into three different age groups: 10–11-, 12- and 13-year-olds. The strength and flexibility sections are the same for all age groups, while the test exercises of the technical skills vary by age group. The technical skill exercises have changed somehow each year due to the problems in interpretation in some of the exercises and/or due to the deficiencies in gymnasts´ techniques or in general skills. Example of Minoritest exercises can be found on the following websites (only in Finnish):

https://www.voimistelu.fi/Portals/0/Naisten%20telinevoimistelu/2019%20Minoritestist%C3%B6.pdf (technical skill test exercises).

https://www.voimistelu.fi/Portals/0/Naisten%20telinevoimistelu/NTV%20valmennusryhmien%20fyysiset%20testit_09032018.pdf (physical performance test exercises).

The purpose of this study was to examine the relationships between gymnasts' Minoritest results and success in competitions after the test and also to see whether any of the test sections predict future success in competitions. The aim of this study was to find out the Minoritest´s potential to identify the most likely talented gymnasts to join the national team pre-training group.

METHODS

This study was conducted as a retrospective quantitative research that compared the test results of the gymnasts (N=215; age 10–13) who participated in the Minoritest in 2006–2010 to the competition results after the Minoritest until the end of 2016. The test results of those gymnasts who participated in the Minoritest in several different years, were analysed as separate performances. The total number of the test participants was 328. The competition results consisted of all the available results between 2006–2016, depending on when the gymnast participated in the test and for how long she has been competing after the test, but did not include results before Minoritests, apparatus specific competition results, team competition results or international competition results.

The Minoritest results as well as competition results were scaled to the seven-step-scale so that a certain percentage of the maximum points corresponded between values 1–7. The purpose of the scaling was to make the test and competition results comparable, and to separate the inadequate performances from the excellent ones (1=inadequate, 2=satisfactory, 3=fairly good, 4=good, 5=very good, 6=creditable, 7=excellent). The Minoritest results were divided into three sections: technical skill (subdivided into vault, uneven bars, balance beam and floor sections), flexibility and strength sections. The competition results were divided into vault, uneven bar, balance beam, floor, total competition score and competition level. In addition, the competition levels (shown in table 1) were scaled to a five-step-scale because the Finnish competition system in female gymnastics changed during the review period.

Each gymnast had a different amount of competition results, still at least five, after the Minoritest. The average

competition result, weighted for the competition level, were calculated for each gymnast separately for each apparatus and for total competition score by using the scaled results and competition levels [(Result 1 * competition level + result 2 * competition level + … + result n * competition level) / N (the amount of results)]. The average competition levels were calculated for each gymnast. The average total competition scores and levels of the gymnasts who participated in the Minoritest were also compared to the average total competition scores and levels of a random number (N=180) of gymnasts who had not participated in the test. This was made to find out the level on which the non-participants were on their competition success. Finally, from the average total competition scores, the top 50 gymnasts among those who participated in the test and among all (gymnasts who did and did not participate in the test) were separated (as value 1) from the rest of the gymnasts´ average total competition scores (as value 0). All the comparisons of this study between the test results and competition results, as well as the comparison between the gymnasts who participated in the test and those who did not, are made by using the gymnasts´ average competition results (vault, uneven bar, balance beam, floor, total competition score) and average competition level.

Table 1
Scaling of the competition levels.

Scaling category	Old system competition level	New system competition level
1	2, 3	D
2	4	E, 2
3	5	F, 3
4	6	4
5	7, 8	5

The research material was analysed using IBM SPSS Statistics 24 -software. The normal distribution of the material was tested by the Kolmogorov-Smirnov test. Nominal and ordinal measures were used to classify the material variables.

Crosstabs and Chi-Square tests were used for testing how the top 50 gymnasts in the average total competition scores were divided into the group of gymnasts who had participated in the Minoritest and into the group of gymnasts who had not participated in the test. In the analysis, those gymnasts who had participated in the Minoritest were subdivided into the test ranking groups of 1–10, 11–20, 21–30 and >30.

The Kruskal-Wallis test was used to analyse the differences in the distribution of the average total competition score and the average competition level by test ranking groups. It was also used for testing the age effect on test results by testing the distribution equality of the test results of different test sections between different age groups (the 10–11-, 12- and 13-year-olds).

The Mann-Whitney U test was used to analyse the differences in the distribution of the average total competition score and in the average competition level between the gymnasts who had and gymnasts who had not participated in the Minoritest.

Spearman´s correlation coefficient was used to explore the correlations between the test results of different test sections and competition success. In the analysis the apparatus specific test results of the technical skills were compared to the similar apparatus specific average competition results. The total test results of the technical skills were compared to the average total competition score and to the average competition level. The test results of the flexibility and strength sections were compared to the apparatus specific average competition results, to the average total competition score and to the average competition level. The total test score was compared to the average total competition score and to the average competition level. Spearman´s correlation coefficient was also used to explore the relationships of the

test results of different test sections to the average total competition score and to the average competition level by age groups.

RESULTS

Minoritest results connection to the competition success

Figure 1 shows the distribution of the average total competition score and of the average competition level by test ranking groups. The differences between the test ranking of 1–10 and 21–30; 1–10 and >30; 11–20 and >30 were statistically very significant ($p \leq 0.001$). The differences between test ranking of 21–30 and >30 were statistically significant ($p \leq 0.01$). Those gymnasts with top 10 results in the test showed relatively the highest values in the average total competition score and in the average competition level.

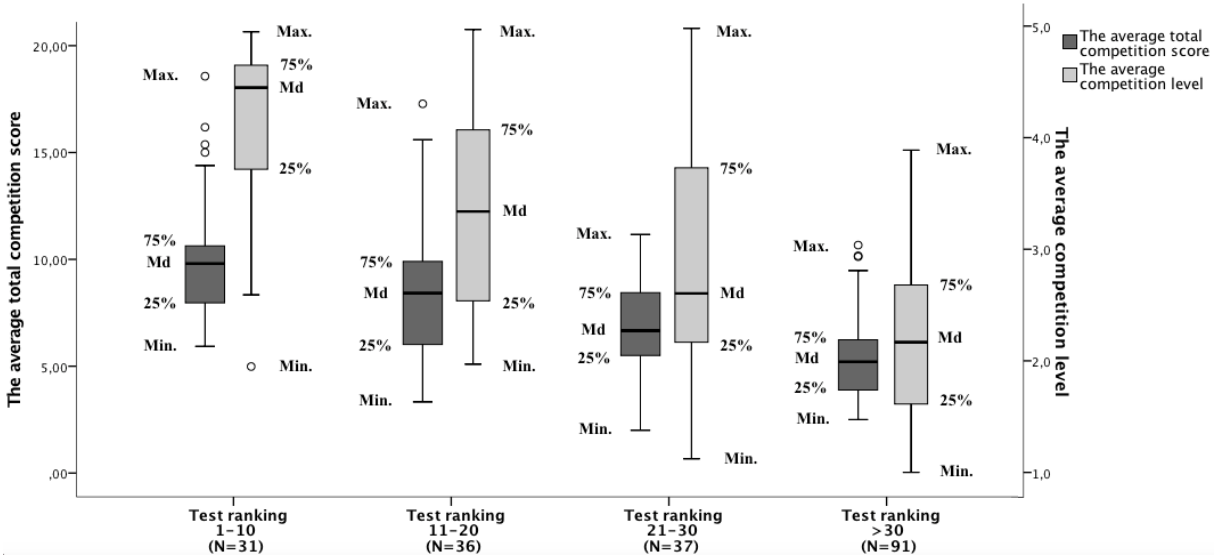
Figure 2 shows the distributions of the average total competition score and of the average competition level between the gymnasts who participated in the test and those who did not. The gymnasts who participated in the test showed relatively higher competition scores and progressed into higher competition levels compared to those who did not participate in the test. The differences between these two groups were statistically very significant ($p < 0.001$). The results of the gymnasts who did not participate in the test showed some clear deviating values (marked with black spots) from the rest of the results.

The crosstabs of how the top 50 gymnasts in the average total competition scores were divided into the gymnasts who did and into the gymnasts who did not participate in the Minoritest, showed that the majority (92%) of the best gymnasts in competitions participated in the Minoritest. Those with top 10 results in the test had the highest proportion (39%) of being among the best in the competitions. Test ranking of 11–20 showed also a connection (31%) of being among top 50 in the competition results. 8% of the best in competitions didn´t participate in the test. The Chi-Square test showed statistically a very significant reliance ($p < 0.001$) between the top placing in the test and the top placing in the competitions.

The test characteristics´ connection to the future competition success

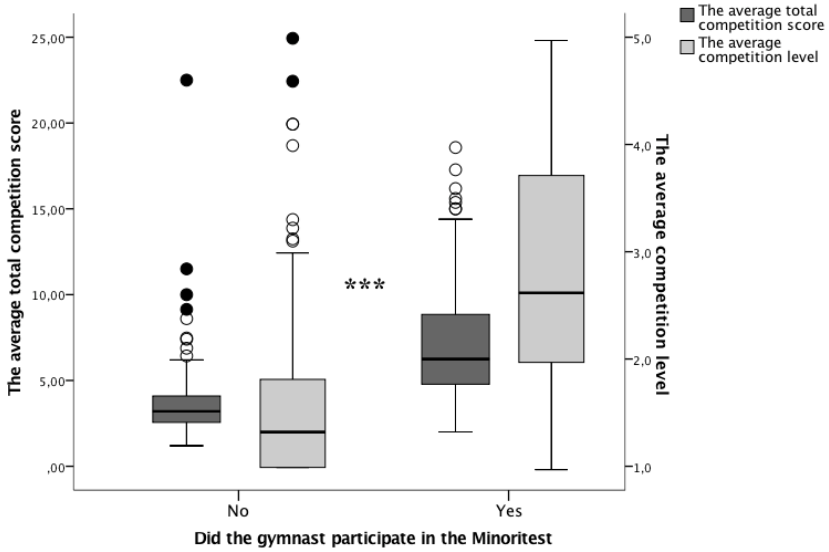
Table 2 shows the different test sections´ test results correlation coefficient (r) and the coefficient of determination (r^2) to the average competition results and level. In the comparisons, the strength section showed significant coefficient of determination ($25 \leq r^2 \leq 36$) to the average floor competition result, total competition score and especially to the average competition level. The total test score showed very significant coefficient of determination ($30 < r^2 \leq 37$) to the total competition score and especially to the average competition level. Rest of the table 2 correlation comparisons showed either slight ($10 \leq r^2 < 25$) or not significant ($r^2 < 10$) coefficient of determination.

Table 3 shows the correlation coefficient (r) and coefficient of determination (r^2) of the test results of different test sections to the average total competition score and to the average competition level by age groups. In the 10–11-year-olds the test results of the technical skills and strength section showed very significant coefficient of determination ($28 \leq r^2 < 35$) to the average total competition score and to the average competition level. In the 13-year-olds the test results of the technical skills showed very significant coefficient of determination to the average competition score ($r^2 \approx 35$) and the test results of the strength section showed significant coefficient of determination to the average competition level ($r^2 \approx 27$).



N=count, Md=median, 25%=lower quartile, 75%=upper quartile, Min.=minimum, Max.=maximum

Figure 1. Descriptive statistics of test ranking groups in the average total competition score and level.



**** Statistically very significant difference (p≤0.001) between the gymnasts who participated and those who did not participate in the Minoritest.*

Figure 2. The distribution of the average total competition score and the average competition level between the gymnasts who had and gymnasts who had not participated in the Minoritest.

Table 2
Test results correlations to the competition results.

		The average competition results and competition level					
		Vault	Uneven bar	Balance beam	Floor	Total competition score	Competition level
Minoritest results							
Vault	r	0.094					
	r^2	-					
Uneven bar	r		0.461**				
	r^2		21.3%				
Balance beam	r			0.348**			
	r^2			12.1%			
Floor	r				0.436**		
	r^2				19.0%		
Technical skills	r					0.478**	0.408**
	r^2					22.8%	16.6%
Flexibility	r	0.228**	0.161*	0.219**	0.260**	0.231**	0.328**
	r^2	5.2%	2.6%	4.8%	6.8%	5.3%	10.8%
Strength	r	0.496**	0.430**	0.427**	0.510**	0.501**	0.600**
	r^2	24.6%	18.5%	18.2%	26.0%	25.1%	36.0%
Total test score	r					0.554**	0.609**
	r^2					30.7%	37.1%

*Statistically almost significant reliance in the level of ($p \leq 0.05$).
** Statistically significant reliance in the level of ($p \leq 0.01$).

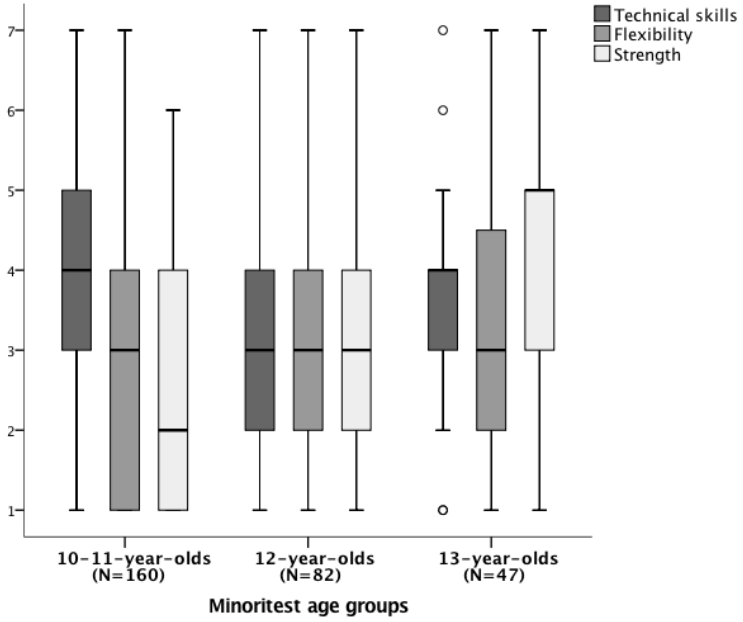


Figure 3. The distribution of the test results of different test sections by age groups.

Table 3
Test results correlation to the competition success by age groups.

		Average total competition score	Average competition level
Minoritest results:			
Technical skills			
10–11-year-olds (*N=124*)	r	0.578***	0.589**
	r^2	33.4%	34.7%
12-year-olds (*N=40*)	r	0.441**	0.423**
	r^2	19.4%	17.9%
13-year-olds (*N=31*)	r	0.589**	0.266
	r^2	34.7%	-
Flexibility			
10–11-year-olds (*N=124*)	r	0.281**	0.354**
	r^2	7.9%	12.5%
12-year-olds (*N=40*)	r	-0.034	0.023
	r^2	-	-
13-year-olds (*N=31*)	r	0.134	0.269
	r^2	-	-
Strength			
10–11-year-olds (*N=124*)	r	0.532***	0.560***
	r^2	28.3%	31.4%
12-year-olds (*N=40*)	r	0.286	0.497***
	r^2	-	24.7%
13-year-olds (*N=31*)	r	0.341	0.523**
	r^2	-	27.4%

**Statistically significant reliance in the level of ($p \leq 0.01$).
*** Statistically very significant reliance in the level of ($p \leq 0.001$).

DISCUSSION

The purpose of this study was to examine the relationships between gymnasts' Minoritest results and competition success after the Minoritest and by that to find out the potential of the Minoritest to identify the most likely talented gymnasts to join the Finnish national team pre-training group.

Minoritest results connection to the competition success

The purpose of the gymnasts´ performance and technical skill tests is to help the clubs and organizations to identify and select potential gymnasts objectively and utilizing the existing resources as efficiently as possible. The problem in the talent identification is the poor ability of the tests to predict the future performance and the dropout of the selected gymnasts due to various reasons. (Pion, et al, 2017.)

Those gymnasts with top 10 results in the test had relatively higher competition scores and competed in higher levels after the test compared to the other gymnasts who participated in the test (Figure 1). Although the total test score and the average total competition score showed a positive relationship, the relation, however, cannot be considered unequivocal. This was shown for example by the fact that 36% of the top 10 gymnasts in the test were not among the top 50 in the competition results. The difference

between the test success and the competition success after the test can be influenced by injuries as well as, for example, the fact that at the time of the test gymnasts are still young which is why the gymnast´s development is strongly governed not only by the gymnast's biological growth and development, but also by training responses (Armstrong & Barker, 2012; Armstrong, et al, 2001; Mountjoy, et al, 2008; Van Praagh & Dore, 2002; Prescott, 1999; Vayens, et al, 2008). A gymnast who does well in the test is not necessarily be able to maintain talent through the growth (Vayens, et al, 2008). The training and the amount and quality of training also have an impact on the competition success of the gymnasts. Those gymnasts with top 10 results in the test have had the opportunity to be part of the buoyant training, unlike the non-selected gymnasts. The best-performing gymnasts in the test can thus be expected to have a greater success in competitions in the future. On the other hand, if there are defects in training after the tests, potential gymnasts might drop out.

Participation in the Minoritest is optional which is why all the 10-13-year-old gymnasts do not participate in the test annually. The purpose of the comparison between the gymnasts who participated and gymnasts who didn´t participate in the test was to get information on whether all the potential gymnasts participate in the Minoritest, and whether some of the potential gymnasts outside the tests are excluded from the national team pre-training group. The results showed that the gymnasts who participated in the test received, with the exception of exceptions, relatively higher competition results and competed in higher competition levels (Figure 2) compared to the gymnasts who did not participate in the test. The majority (92%) of the best gymnasts in the competitions had participated in the Minoritest. Those with top 10 results in the test showed the highest ratio (39%) of being among the best in the competitions. However, the deviations in figure 2 of the gymnasts who had not participated in the test and the fact that nearly 8% of the top 50 gymnasts in the competitions were those who had not participated in the test, shows that some, yet a very small number, of potential gymnasts outside the tests are excluded from the national team pre-training group. This gives a consideration on how to get all the potential gymnasts cost-effectively participate in the Minoritest.

The test characteristics´ connection to the future competition success

Gymnastics is versatile type of sport which makes it difficult to highlight individual characteristics that are important for success. Previous studies consider strength, speed, flexibility and certain type of body composition important in elite gymnasts. However, consensus about what features predict success in the future has not been found. In this study individual test exercises were not considered but the test results were examined by test sections. The purpose was to find out whether any of the test sections predict the future competition success and whether it is worth to underline some test sections´ importance in the selection process.

The gymnast´s physical and technical characteristics develop through training as the gymnast progresses to higher competition levels. The test results measuring the gymnast´s physical fitness have been shown to be related to the gymnast´s current competition level. For example, in the study of Sleeper, Kenyon and Casey, (2012) which assessed the relationships between the competitive female gymnast´s physical fitness test scores and the gymnast´s current competition level, there was a significant correlation between the gymnast´s total test score and current competition level. In this study, the total test score and the average total competition score and particularly the average competition level showed a positive connection. Unlike

Sleeper, et al, (2012) study which compared the test scores to the gymnast´s current competition level, in this study the test results were compared to the average competition level from the test year to the end of year 2016. On this basis, the connection between the test results and competition success can be found to predict also the future competition success. In other words, a gymnast who performs well in the test is supposed to perform well in the competitions in the future and consequently progress to higher competition levels. Participation in the Minoritest requires a certain minimum competition level. However, there is no upper limit for the competition level for the test participation. For this reason, it would be advisable in the test results to take into account the gymnast´s current competition level and the amount of training associated with the competition level, due to their impact on the test results of the gymnast.

The gymnast´s physical and technical skill characteristics depend not only on the amount and quality of training but also on the stage of growth. Age and on the other hand the effect of growth and training background to the test success was studied by comparing the distribution of the test results between different age groups. Comparison of the test results of different test sections between different age groups showed a statistically significant difference in the test results of the strength section, while there were no significant differences in the technical skill and flexibility sections or in the total test scores. A closer look at the correlations between the test results of the different age groups to the competition success showed that the test results of the strength section were most closely related to the competition success in the 10–11-year-olds. In the 12–13-year-olds the test results of the strength section did not correlate to the average total competition score but did show a connection to the average competition level. The test results from the technical skills showed a significant connection to the average total competition score in all test age groups and to the average competition level in the 10–12-year-olds but not in the 13-year-olds. The test results of the flexibility section showed a weak connection to competition success in all age groups. Despite the fact, that there was a statistically significant difference between the different age groups in the test result of the strength section, there was no statistical difference between the different age groups in the total test scores. This suggests that the test results from the technical skills compensate the differences in the total test scores between the different age groups because the test exercises in the technical skills are different in each age group.

Gymnasts mature and develop at different stages, making it difficult to identify gymnasts with potential, especially by age group (Vaeyens, at al, 2008). If the test results are compared only to the gymnast´s chronological age, there is a risk that potential gymnasts will not be selected (Vaeyens, et al., 2008). The tests can take part at the ages of 10 to 13, which gives a sliding margin to the not simultaneous growth and participation in the tests. On the other hand, the age groups have different difficulty levels in the technical skill section, which limits the consideration of non-simultaneous growth at different-aged gymnasts. Also, the test results of the technical skill section are influenced by the skill level of test movements in relation to the current skill level of the gymnast. The gymnast's competition level at the time of the test, the stage of growth, and the "unsuitable" test movements, may, in other words, skew the gymnast's future potential to succeed. This gives some reflection on how to eliminate the gymnast current technical skill level related to the current competition level when testing gymnast technical skills.

The Minoritest strength section included various exercises which tested the gymnast´s explosive power, speed, agility

and specific strength-resistance. In this study the finding of the connection between the test results of the strength section and competition success, especially in the 10-11-year-olds, supports previous studies (e.g., Bale & Goodway, 1990), which emphasized the importance of strength, power, local muscular strength and agility to the competitive performance. Surprisingly, there was no significant reliance between the test results of the flexibility section and competition success, although, flexibility is considered to be an important feature for gymnastic performance. These findings support the statement, that the natural strength is more important than the natural flexibility as flexibility is easier to gain in the later years than strength, from which it is more than 50 % hereditary (Hohmann, Lames & Letzelter, 2007).

In previous studies (e.g., Bencke, Damsgaard, Saekmose, Jørgensen & Klausen, 2002; Nelson, Johnson & Smith, 1983, Hicks, 2005; Prescott, 1999) it has been found that the gymnast´s strength characteristics are associated with higher training levels when competing in higher competition levels. In this study, the strength properties were studied before the development of the strength properties in the higher competition levels. The results showed a clear positive correlation between the test results of the strength section and the average competition level. In higher competition levels performing more difficult movements, it requires more strength. For naturally powerful gymnasts it is supposedly easier to upgrade to higher levels than non-powerful gymnasts, because they have in principle more strength for more difficult movements. The clear link between the test results of the strength section of the 10–11-year-olds and the competition success, support the idea that naturally stronger gymnasts will have a greater likelihood of success in competitions in the future (Ho, 1987). This is justified by the fact that the strength characteristics of the 10–11-year-olds were measured while the gymnasts competed in the lower competition levels before the strength characteristics developed in the higher competition levels. The fact that the test results for the 12- and 13-year-old did not show a connection to the competition results but showed a connection to the average competition level, suggests that older gymnasts' test results of the strength section are likely to be more related to the current competition level than predicting the future competition success. What may affect this is the fact that the older gymnasts´ strength characteristics are compensated not only by the growth but also by the training effects as gymnasts get older and move into higher competition levels.

CONCLUSIONS

The Minorititest results give the direction of the gymnast´s potential to succeed in the future. Those gymnasts with top 10 results in the Minoritest showed the highest probability of being among the best in competitions in the future. Top placing in the test does not, however, directly guarantee that the gymnast would also be among the best in the competitions in the future. This is influenced by the various factors from the gymnast herself and from what opportunities the environment has to offer for the success after the test. The majority of the best gymnasts in competitions had participated in the Minoritest. However, outside the Minoritests, single potential gymnasts are excluded from the selection. This issue requires consideration on how to get all the potential gymnast participate in the Minoritest.

Based on this study, it is not possible to underline any individual test characteristics to identify talented gymnasts. According to the results, the strength section can be considered as a significant unity in the 10–11-year-olds to predict the future potential to succeed. In

the 12–13-year-olds the test results of the strength section were more related to the gymnast´s current competition level than predicting the future potential of success. The test results of the flexibility section showed a weak connection to the competition success in all age groups. The test results from the technical skills showed a connection to the average competition results in all age groups. However, the gymnast´s current competition level, the stage of growth and the current technical skill level related to the test movements, should be considered when observing the test results.

Based on the findings, it would be more desirable for the Finnish national team pre-training group to choose the gymnasts who get good test results from the technical skill and strength sections rather than from the flexibility section. In the talent identification it would be also good to emphasize the gymnast´s potential to develop in the long term. As the gymnasts are getting older and progress into higher competition levels the differences in the technical and physical characteristics are more related to the gymnast´s current competition level than separating the future potential to succeed. It would be desirable to monitor the gymnast´s performance characteristics and the ability to develop in the long term before the Minoritests as the gymnast is still competing in lower competition levels.

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