

EEDS ANALYSIS OF PHYSICAL AND TECHNICAL TEST MODELS TO IDENTIFY CHILDREN TALENTS IN IN NATIONAL DEVELOPMENT CATEGORY IN GYMNASTIC AEROBIC SPORTS

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Abstract

Background: Physical test models and techniques tailored to the characteristics of children and sports are essential in identifying children's talents. **Purpose:** This study analyzed the need for a physical test instrument consisting of bio-motor strength, flexibility, and balance. Another purpose was to analyze the need for a technical test instrument consisting of 7 basic aerobic gymnastic steps in the national development category. **Design/methodology/approach:** This descriptive quantitative study utilized a questionnaire as its research instrument, with the study sample involving 25 students. The data were analyzed using the calculation of percentage statistical data. **Result:** The study results show that the flexibility test model obtained a dominant value of 44% (included in the easy category), the balance test model obtained a dominant value of 36% (included in the very easy category), and the strength test model obtained a dominant value of 40% (include in the fairly easy category). As for the results of technical abilities, namely: the results of the march technique (88%), jogging technique (60%), jumping jack (92%), and lunges (40%) fell under the very easy category. Meanwhile, skip technique (40%), knee lift (40%), and high kick (56%) are included in the quite easy category. **Conclusion:** (1) physical and technical test instruments can be used to identify children's talents in the national development category of aerobic gymnastics, and (2) physical and technical test instruments developed by the researchers are acceptable, appropriate, useful, and can be implemented by children in the national development category of aerobic gymnastics.

Keywords: model, physical test, technical test, aptitude identification, aerobic gymnastic

1. INTRODUCTION

Gymnastics is a sport with complex work characteristics (Siahkhouhian et al., 2013). Gymnastics itself is divided into two categories: achievement and general gymnastics. General gymnastics consists of physical fitness gymnastics, therapy gymnastics, and rehabilitation. Meanwhile, achievement gymnastics are grouped into several categories: men's artistic, women's, rhythmic, and aerobic gymnastics (which includes step aerobics and aerobic dance), trampoline, and acrobatic gymnastics. Along with the development of the times, achievement gymnastics has

also experienced a significant development as new types of gymnastics keep emerging between to artistic and rhythmic gymnastics. One of them is aerobic gymnastics.

Aerobic gymnastics is a sport which requires the ability to perform high-intensity and complicated movements, and have patterns referring to music (Aura et al., 2012; Mariana & Orlando, 2014). Aerobic gymnastics is carried out in maximum intensity, with a competition duration setting of 1 minute 30 seconds with a time tolerance of ± 5 seconds (Tibenská & Medeková, 2014). In every appearance, aerobic gymnastics requires good physical and technical abilities to obtain maximum performance (Raiola et al., 2013). The physical elements applied in this sport are very complex. Almost all components of the bio-motor are involved. Some of the main physical components in aerobic gymnastics are flexibility, balance, and strength as the supports for maximum performance (Mezei et al., 2019).

Strength is a component of physical condition that concerns the problem of an athlete's ability when using his muscles to receive a load for a particular working time (Mayorga-Vega et al., 2013). Balance is the ability of a person to control the nervous organs of his muscles, during rapid movements, with a rapid change in the location of weight points as well, both in static and more so in dynamic movements (Thomas et al., 2013).

Flexibility is the effectiveness of a person in his self-adjustment to carry out all body activities with the broadest possible stretching, especially the muscles and ligaments around the joints (Behm & Chaouachi, 2011). According to Budiarti et al. (2022), flexibility is the motion area of one or several joints. One of the unique characteristics of gymnasts is that they have good flexibility in almost all their joints, which results in a gymnast being able to perform bending well, kissing knees, splits, and so on. Low flexibility results in gymnasts not being able to perform well.

Technical skills are no less critical in aerobic gymnastics because it is an exercise factor in gaining achievements. Technique is the second training factor after physical (Bompa, 2012). Good techniques mastery will ease the application of playing tactics or performance when competing. Technique is a process of movement and proofing in practice conducted as best as possible to complete a definite task in sports (Hughes & Franks, 2004). Technique practice is a skill exercise to improve skill perfection. According to Bompa & Buzzichelli (2019), the technique includes the overall structure, the parts that are carefully incorporated, and the movements an athlete has in his efforts to perform the exercise.

The purpose of technical exercises is to enhance the skills of technical movements and obtain their automation in a sport (Yudanto et al., 2022). Movement automation is characterized by the results of accurate and consistent movements. Very few or rarely make movement errors and can always perform movements consistently in different and changing situations and conditions. Aerobic gymnastics has several basic techniques, including basic foot and arm movement, difficulty elements, and choreography (Code of Points Aerobic Gymnastics 2017-2020, 2017).

The basic foot has seven basic movements; march, jumping jack, lunges, knee up, kick, skip, and jogging. Arm movement consists of hand movements up, forward, to the left and right sides, turning, and so on. The difficulty element or difficulty level section consists of static and dynamic elements. Choreography is a series of motions consisting of aerobic dance movement, aerobic patterns, and basic steps. matters relating to the race of aerobic gymnastics include category, age, music, stage, and choreography.

With an understanding of physique and technique in aerobic gymnastic sports, it is necessary to have appropriate and systematic coaching to produce an excellent physical and technical basis. In addition to understanding the needs of physical components and techniques to support performance in gymnastic and aerobic sports, it is also necessary to identify talent in the sport of aerobic gymnastics. One way to identify a person's talent is by conducting an assessment, testing, and evaluation.

Assessment and evaluation are critical because training and assessment are inseparable whole (East, 2013). Training is said to be good if the assessment tools are excellent so it will make a good judgment that eventually motivate athletes to train (Hardcastle et al., 2015). Aerobic gymnastics has three categories; National Development for 9-11 years old, Age Group 1 for 12-14 years old, and Age Group 2 for 15-17 years old (Code of Points Aerobic Gymnastics, 2017). Thus, to get optimal achievements, it is essential to have aerobic gymnastics coaching tailored to the age category. Furthermore, in coaching, a measuring instrument is needed to identify children's talents following the characteristics of the sport and the characteristics of athletes or potential users of the instrument.

This study aims to analyze the need for a physical test instrument consisting of bio-motor strength, flexibility, and balance. Another purpose was to analyze the need for a technical test instrument consisting of seven basic aerobic gymnastic steps in the national development category. It was expected that this research could be useful to determine the need for physical and technical test models that aim to screen/identify the talents of prospective athletes, especially in the national development category of aerobic gymnastic sports.

2. METHOD

This study used a quantitative descriptive research design (Nassaji, 2015; Paquot & Plonsky, 2017) and was one of the stages in compiling the development of test instruments to identify talents in aerobic gymnastics according to the research & development theory proposed by Borg & Gall (1984) in the small group test stage.

The study sample involved 25 elementary school students aged around 7-8. The researchers determined the age around that number because the students join the championship at the age of 9-11 years in gymnastic aerobics in the national development category. This made the researcher want to prepare athletes earlier and make them be better prepared when they reach 9-11 years

old. In addition, the decision on the age can also be used to determine the level of a child's exposure as early as possible.

The research instrument included a questionnaire and a draft test instrument guide to identifying children's talents in the aerobic gymnastics sport in the national development category. Ten questions were adjusted to the understanding and abilities of children aged 7-8 years, with a validity value using a Pearson correlation of 0.917. Meanwhile, the reliability value of the instrument used the Cronbach's Alpha reliability test with a value of 0.976. This instrument consisted of an indicator of implementability or the ability of the instrument to be implemented. The easier the implementation means that the test instrument is more suitable for identifying aerobic gymnastic talent in the national development category.

The data analysis in this study was descriptive and quantitative in the form of a percentage. This research instrument applied a questionnaire with a rating scale of 1 to 5: very easy (5), easy (4), quite easy (3), less easy (2), and not easy (1). The data then were analyzed using the following calculation formula:

$$P = \frac{f}{N} \times 100\%$$

Note:

P: A percentage value

f: the frequency at which the percentage is being found

N: Number of Case

3. RESULTS

The presented results are not the results of measurements, but the results of input/assessment from the students, which are seen from the ability of the instrument to be implemented. In this small-scale trial, 28 students from State Elementary School Bakalan participated. However, three students were absent when the test was carried out, so the total number of students was 25. The results are presented as follows:

1) Physical Ability Results

This is a small group trial of talent identification test model assessed by 25 students of State Elementary School Bakalan using a simple questionnaire, where the questionnaire filling was assisted by the supervisor, considering the abilities of the students aged 7-8 years. The data presented the results of input/assessment from the students, which are seen from the students' perspective about the easiness of the instrument to be used by them. The results of physical abilities are presented as follows:

Table 2. Physical Ability Data Recap Results

Indicators	Test Instrument	5	4	3	2	1
Implementability	Flexibility Test	6	11	5	1	2
	Balance Test	9	7	8	1	0
	Strength Test	2	12	10	0	1

Based on Table 2, the data on physical ability results are described as follows:

a) Flexibility Test

The results of a small group test on the implementability indicator for the flexibility test showed that two students (8%) stated that it was very difficult to do, one student (4%) stated that it was difficult to do, 5 students (20%) stated that it was quite easy to do, 11 students (44%) stated that it was easy to do and while 6 other students (24%) stated that it was very easy to do.

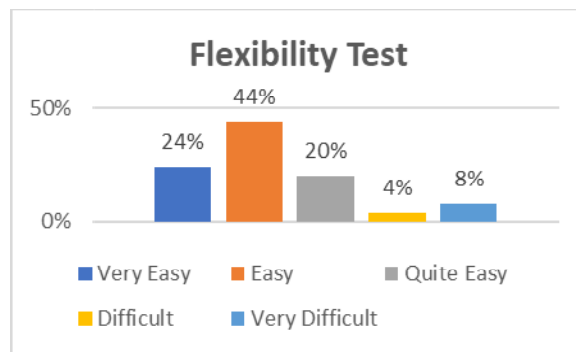


Figure 1. Flexibility Test Ability Diagram

Based on the study results, the conclusion and decision-making on the implementability in the flexibility test instrument obtained a dominant score of 44% in the easy category, which meant that qualifications regarding the flexibility test instrument could be used to identify the talents of gymnasts in the national development category.

b) Balance Test

The results of the small group test on the implementability indicator for the balance test showed as many as 0 student (0%) stated it was very difficult to do, 1 student (4%) stated that it was difficult to do, 8 students (32%) stated that it was quite easy to do, 7 students (28%) stated that it was easy to do and while 9 other students (36%) stated that it was very easy to do.

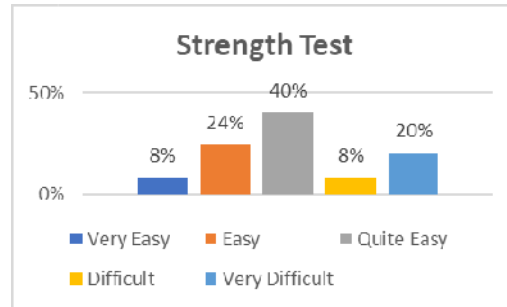


Figure 2. Balance Test Ability Diagram

Based on the study results, the provision of conclusions and decision-making on implementability in the balance test model obtained a dominant score of 36% in the very easy category. This result meant that qualifications regarding the balance test instrument could be used to identify the talents of gymnasts in the national development category.

c) Strength Test

The results of a small group test on the implementability indicator for the strength test showed that as many as 5 students (20%) stated that it was very difficult to do, 2 students (8%) stated that it was difficult to do, 10 students (40%) stated that it was pretty easy to do, 6 students (24%) stated that it was easy to do, and while 2 other students (8%) stated that it was very easy to do.

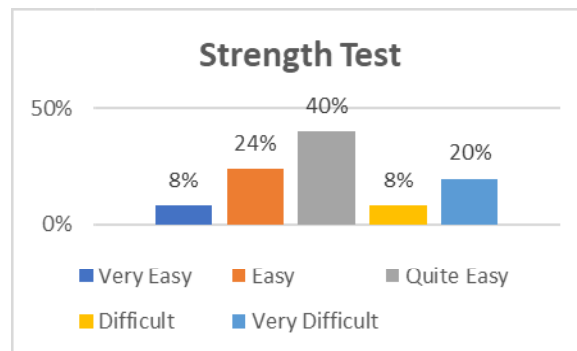


Figure 3. Strength Test Ability Diagram

Based on the study results, the provision of conclusions and decision-making on implementability in the strength test model obtained a dominant score of 40% in the easy category. This result meant that qualifications regarding the balance test instrument could be used to identify the talents of gymnasts in the national development category.

2) Technical Ability Results

The data presented from the results of the technical ability test trial in this study are not the result of measurements but the results of input/assessment from the students in terms of the implementability of the students according to the needs of the students. Such results will be presented as follows:

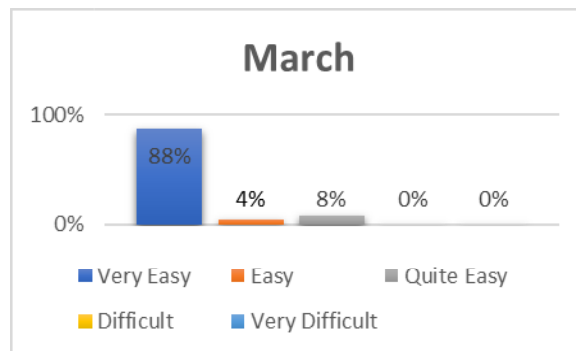
Tabel 3 Technical Ability Data Recap Results

Indicator	Movements	5	4	3	2	1	Total
Implementability	March	22	1	2	0	0	25
	Jogging	15	7	3	0	0	25
	Skip	4	2	10	7	2	25
	Knee Lift	6	5	10	2	2	25
	Hight Kick	1	2	14	5	3	25
	Jumping Jack	23	2	0	0	0	25
	Lunges	10	7	3	4	1	25

Based on table 3, data on the results of technical capabilities are obtained and described as follows:

a) March

The results of a small group test regarding the implementability of the march technique showed that as many as 2 students (8%) stated that it was quite attractive, quite appropriate, and quite feasible, and 1 student (4%) stated that it attractive, appropriate, and feasible. In comparison, 22 other students (88%) stated very attractive, very appropriate, and very worthy. The diagram is presented as follows:

**Figure 4. Diagram of March Technical Ability**

The conclusions and decisions made regarding the march technical ability test model based on the study's results got 88% results in the very easy category, which means that the qualifications regarding the march technique test model can be used to identify the talents of gymnasts in the national category development.

b) Jogging

The results of a small group test regarding the implementability of jogging techniques showed that as many as 3 students (12%) stated that they were quite attractive, quite appropriate, and quite feasible, 7 students (28%) stated that they were attractive, appropriate, and feasible. In comparison, 15 other students (60%) stated very attractive, very suitable, and very worthy. The diagram is presented as follows:

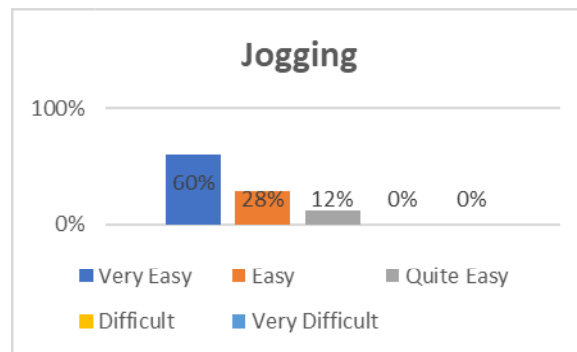


Figure 5. Diagram of Jogging Technical Ability

The conclusions and decisions made regarding the jogging technical ability test model based on the results of the study got a result of 60% in the very easy category, which means that the qualification regarding the jogging technique test model can be used to identify the talents of gymnasts in the national category development.

c) Skipp

The results of a small group test regarding the implementability of skipp technique showed that as many as 2 students (8%) stated that it was very difficult, 7 students (28%) stated that it was difficult, 10 students (40%) stated that it was quite easy, quite attractive, quite appropriate, and quite feasible, 2 students (8%) stated interesting, appropriate, and feasible while the other 15 students (16%) stated very attractive, very appropriate, and very feasible. The diagram is presented as follows:

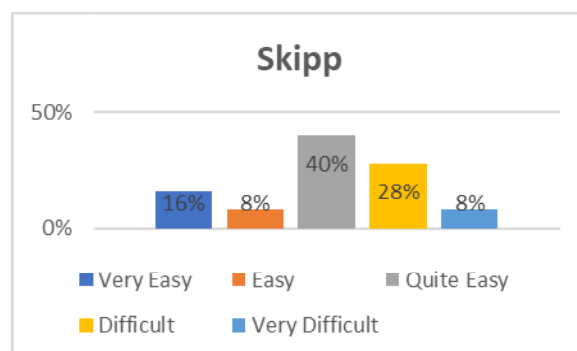


Figure 6. Diagram of Skipp Technical Ability

The conclusions and decisions made regarding the skipp technical ability test model based on the results of the study obtained the dominant percentage result in a value of 40% in the quite easy category, means that qualifications regarding the skipp technique test model can be used to identify the talents of gymnasts in the national development category.

d) Knee Lift

The results of small group tests regarding the implementability of knee lift technique showed as many as 2 students (8%) stated that it was very difficult, 2 students (8%) stated that it was difficult, 10 students (40%) stated that it was quite easy, quite interesting, quite appropriate, and quite feasible, 5 students (20%) stated interesting, appropriate, and feasible while the other 6 students (24%) stated very attractive, very appropriate, and very feasible. The diagram is presented as follows:

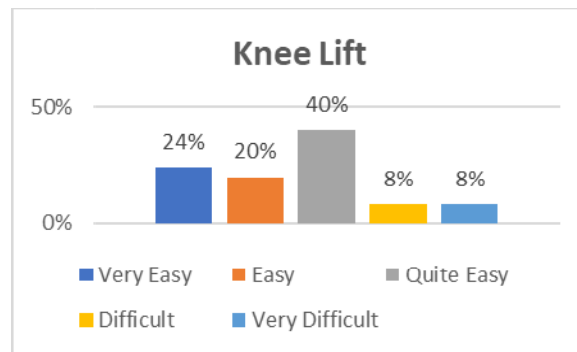


Figure 7. Diagram of Knee Lift Technical Ability

The conclusions and decisions made regarding the knee lift technical ability test model based on the study results obtained the results of a dominant percentage in the value of 40% in the quite easy category. This means that the qualification regarding the knee lift technique test model with a good enough category can be less used to identify the talents of gymnasts in the national development category.

e) Hight Kick

The results of a small group test regarding the implementability of the high kick technique showed that as many as 3 students (12%) stated that it was very difficult, 5 students (20%) stated that it was difficult, 14 students (56%) stated that it was quite easy, quite attractive, quite appropriate, and quite feasible, 2 students (8%) stated attractive, appropriate, and worthy. In contrast, the other 1 student (4%) stated very attractive, very appropriate, and very worthy. The diagram is presented as follows:

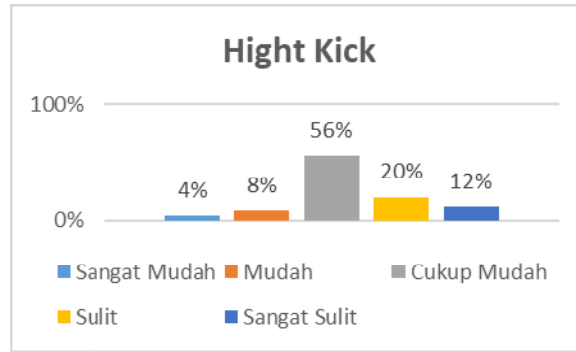


Figure 8. Diagram of Hight Kick Technical Ability

The conclusions and decisions made regarding the hight kick technical ability test model based on the results of the study obtained the dominant percentage results in the value of 56% in the relatively easy category, means that the qualification regarding the test model the hight kick technique can be used to identify the talents of gymnasts in the national development category.

f) Jumping Jack

The results of a small group test regarding the implementability of the jumping jack technique showed that as many as 2 students (8%) stated that it was attractive, appropriate, and feasible while 23 other students (92%) stated very attractive, very suitable, and very feasible. The diagram is presented as follows:

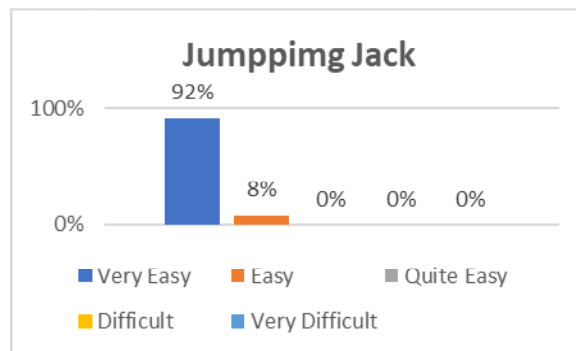


Figure 9. Diagram of Jumping Jack Technique

The conclusions and decisions made regarding the jumping jack technique ability test model based on the results of the study got 92% results in the very easy category, which means that the qualification regarding the jumping jack technique test model is in the very easy category, so it can be used to identify the gymnasts' talents in the national development category.

g) Lunge

The results of small group tests regarding the implementability of the lunge technique showed that as many as 1 student (4%) stated that it was very difficult, 4 students (16%) stated that it was difficult, 3 students (12%) stated that it was quite easy, quite attractive, quite appropriate, and quite feasible, 7 students (28%) stated attractive, appropriate, and feasible. In contrast, the other 10 students (40%) stated very attractive, very appropriate, and very worthy. The diagram is presented as follows:

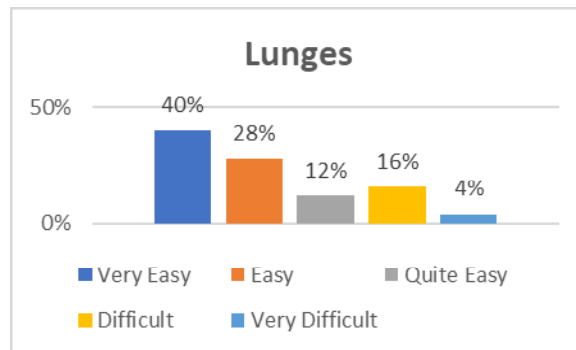


Figure 10. Diagram of Lunge Technical Ability

The conclusions and decisions made regarding the lunge technical ability test model based on the study's results got 40% in the very easy category, meaning that the qualification regarding the lunge technique test model can be used to identify the talents of gymnasts in the national category development.

4. DISCUSSION

Talent is a person's capacity from birth, which also means the hidden abilities a person has as the basis of his/her real abilities (Baker et al., 2018). A person's talent in sports is a fundamental ability concerned with the appearance of movement and a combination of several abilities related to one's attitude and body shape (Cobley et al., 2013).

Talent identification is often interpreted as finding talented children for a particular sport who then, trained regularly and programmatically, is expected to achieve the highest (Byounggoo Ko, 2014). Talent searching can be done with tests or measurements that have been compiled and tested before. The test is a parameter created to foresee the quality of achievement, taking into account the level of physical freshness, the ability to learn movement, and the physical development the child had at that time. In fact, many coaches use equalized tests in the field, such as endurance tests on swimming athletes using balke tests. However, many studies have adjusted based on sports and the characteristics of children, namely research conducted by Qowiyyuridho et al., (2021); Widodo & Nahimana, (2021); Yudhistira et al., (2021); Yudhistira & Tomoliyus, (2020)

According to Louzada et al., (2016), talent identification filters children and teenagers by using physical, physiological, and certain skills tests to identify the potential to be successful in the chosen sports activity. Identifying sports talent is an important stage as it is the foundation for the success of the sports achievement coaching system (Jacob et al., 2018). Whether or not the achievement sports achievement coaching system is successful is greatly influenced by how the process of identifying talents is carried out. Mistakes in carrying out the process of identifying talents will cause loss of achievement or inhibition of athlete regeneration. This talent identification error can also fail in the process of sports coaching. The athletes will also have difficulty achieving optimal achievements (Rasid et al., 2019).

The primary purpose of talent coaching is to identify and select potential athletes, get a sport that matches their potential and interests, and estimate their chances of succeeding in a coaching program to achieve maximum achievements in a particular sport (Holtey-weber, 2018).

Based on the results of studies that have been carried out, the physical test instruments and techniques developed by the researchers can be used to identify the talents of gymnastic and aerobic gymnastic gymnastics in the national development category. According to Penggalih et al. (2016) posit that the purpose of identifying talent is to predict a high degree of the likelihood of whether a potential athlete will be able to complete the training program successfully in the chosen sport in order to be able to measure definitively and perform the next stage of training correctly. Facts show that coaching athletes to achieve peak achievements takes approximately 8-10 years, so the orientation of sports coaching must be started early with appropriate and systematic coaching and training (Bompa & Buzzichelli, 2019). Therefore, the researchers developed the test instruments adapted to age categories and sports by applying the theoretical basis of the “golden age” calculation.

The small group trial stage was a continuation after approval from experts on the instrument model that the researchers developed. According to Borg & Gall (1984), the purpose of field trials is to find out the results of new development products in groups or the number of research subjects that are small (few) and large (many). The results of this trial represent the needs and acceptance of the products that researchers develop.

5. CONCLUSION

Based on the results of the study, it can be concluded that; (1) physical test instruments and techniques can be used to identify children’s talents in the national development category of aerobic gymnastics, and (2) physical test instruments and techniques developed by the researchers are acceptable, appropriate, useful and can be implemented to the children in the national development category of aerobic gymnastics.

REFERENCE

Aura, B., Constanta, U., & Mariana, M. (2012). Corelative Aspects Regarding the Functional Exertion and the Technical Difficulty Elements in High Performance Aerobic Gymnastics.

Ovidius University Annals, Series Physical Education & Sport/Science, Movement & Health, 12(2), 120–126.

Baker, J., Schorer, J., & Wattie, N. (2018). Compromising Talent: Issues in Identifying and Selecting Talent in Sport. *Quest*, 70(1), 48–63. <https://doi.org/10.1080/00336297.2017.1333438>

Behm, D. G., & Chaouachi, A. (2011). A review of the acute effects of static and dynamic stretching on performance. *European Journal of Applied Physiology*, 111(11), 2633–2651. <https://doi.org/10.1007/s00421-011-1879-2>

Bompa, T. O. (2012). *Theory and Methodol of Training*. Kendall/Hunt Publishing Company.

Bompa, T. O., & Buzzichelli, C. (2019). *Periodization-: theory and methodology of training*. Human kinetics.

Borg, W. R., & Gall, M. D. (1984). *Educational research: An introduction*.

Budiarti, R., Siswantoyo, S., & Sukamti, E. R. (2022). Explosive Power and Muscle Flexibility in Junior Gymnasts of Aerobic Gymnastic Based on Different Sexes. *Conference on Interdisciplinary Approach in Sports in Conjunction with the 4th Yogyakarta International Seminar on Health, Physical Education, and Sport Science (COIS-YISHPESS 2021)*, 144–147.

Byounggoo Ko. (2014). Sports Talent Identification and Selection in Korea. *IJASS(International Journal of Applied Sports Sciences)*, 26(2), 99–111. <https://doi.org/10.24985/ijass.2014.26.2.99>

Cobley, S., Schorer, J., & Baker, J. (2013). Identification and development of sport talent: A brief introduction to a growing field of research and practice. In *Talent identification and development in sport* (pp. 21–30). Routledge.

Code of Points Aerobic Gymnastics 2017-2020. (2017). *Fédération Internationale de Gymnastique*.

East, W. B. (2013). A Historical Review and Analysis of Army Physical Readiness Training and Assessment. In *Library of Congress Cataloging-in-Publication Data East*. https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/APRT_WhitfieldEast.pdf

Hardcastle, S. J., Tye, M., Glassey, R., & Hagger, M. S. (2015). Exploring the perceived effectiveness of a life skills development program for high-performance athletes. *Psychology of Sport and Exercise*, 16(P3), 139–149. <https://doi.org/10.1016/j.psychsport.2014.10.005>

Holtey-weber, J. (2018). *Running head: TALENT DEVELOPMENT IN SPORTS AND BEYOND Talent Development in Sports and Beyond* Jorim Holtey-Weber University of Groningen Student Number: 2389142 Supervisor: Ruud den Hartigh. June 2015. <https://doi.org/10.13140/RG.2.2.35783.55208>

- Hughes, M., & Franks, I. M. (2004). Notational analysis of sport: Systems for better coaching and performance in sport. Psychology Press.
- Jacob, Y., Spiteri, T., Hart, N., & Anderton, R. (2018). The Potential Role of Genetic Markers in Talent Identification and Athlete Assessment in Elite Sport. *Sports*, 6(3), 88. <https://doi.org/10.3390/sports6030088>
- Louzada, F., Maiorano, A. C., & Ara, A. (2016). ISports: A web-oriented expert system for talent identification in soccer. *Expert Systems with Applications*, 44(January 2016), 400–412. <https://doi.org/10.1016/j.eswa.2015.09.007>
- Mariana, M., & Orlando, C. (2014). Performance Criteria in Aerobic Gymnastics – Impact on the Sportive Training. *Procedia - Social and Behavioral Sciences*, 117, 367–373. <https://doi.org/10.1016/j.sbspro.2014.02.229>
- Mayorga-Vega, D., Viciano, J., & Cocca, A. (2013). Effects of a circuit training program on muscular and cardiovascular endurance and their maintenance in schoolchildren. *Journal of Human Kinetics*, 37(1), 153–160. <https://doi.org/10.2478/hukin-2013-0036>
- Mezei, M., Wesselly, T., Pelin, R. A., & Grigoriu, C. (2019). Optimisation of selection in aerobic gymnastics by correlating physical and technical elements. *Discobolul – Physical Education, Sport and Kinetotherapy Journal*, 2004. <https://doi.org/10.35189/iphm.icpesk.2019.20>
- Nassaji, H. (2015). Qualitative and descriptive research: Data type versus data analysis. In *Language teaching research* (Vol. 19, Issue 2, pp. 129–132). Sage Publications Sage UK: London, England.
- Paquot, M., & Plonsky, L. (2017). Quantitative research methods and study quality in learner corpus research. *International Journal of Learner Corpus Research*, 3(1), 61–94.
- Penggalih, M. H. S. T., Narruti, N. H., Fitria, F., Pratiwi, D., Sari, M. D. P., Winata, I. N., Fatimah, & Kusumawati, M. D. (2016). Identification of somatotype, nutritional status, food and fluid intake in gymnastics youth athletes. *Asian Journal of Clinical Nutrition*, 8(1–3), 1–8. <https://doi.org/10.3923/ajcn.2016.1.8>
- Qowiyyuridho, G., Tomoliyus, & Fauzi. (2021). Validity and reliability of agility test with dribbling and passing in soccer games. *International Journal of Human Movement and Sports Sciences*, 9(2), 301–307. <https://doi.org/10.13189/SAJ.2021.090218>
- Raiola, G., Giugno, Y., Scassillo, I., & Di Tore, P. A. (2013). An experimental study on Aerobic Gymnastic: Performance analysis as an effective evaluation for technique and teaching of motor gestures. *Journal of Human Sport and Exercise*, 8(2 SUPPL), 297–306. <https://doi.org/10.4100/jhse.2012.8.Proc2.32>
- Rasid, S. M. M., Abdullah, M. R., Juahir, H., Maliki, A. B. H. M., Kosni, N. A., Musa, R. M., Hashim, M. R., Alnamat, A. S. F., Alias, N., & Najmi, N. (2019). Applied multidimensional

analysis for assessing youth performance in sports talent identification program. *International Journal of Recent Technology and Engineering*, 8(2 Special Issue 7), 207–211. <https://doi.org/10.35940/ijrte.B1051.0782S719>

Siahkoushian, M., Aalizadeh, B., & Esmaeilzade, S. (2013). Talent identification of elite Iranian male artistic and trampoline gymnasts. *Middle East Journal of Scientific Research*, 16(1), 51–54. <https://doi.org/10.5829/idosi.mejsr.2013.16.01.2318>

Thomas, K., Wilson, C., & Bradshaw, E. J. (2013). Fundamental Movement Assessment of Young Female Gymnasts. 31 International Conference on Biomechanics in Sports.

Tibenská, M., & Medeková, H. (2014). “Z”-scores of anthropometric and motor parameters of girls in aerobic gymnastics. *Acta Facultatis Pharmaceuticae Universitatis Comenianae*, 61(2), 55–58. <https://doi.org/10.2478/afpuc-2014-0008>

Widodo, H., & Nahimana, S. (2021). REACTION TIME TEST INNOVATION OF TABLE TENNIS PERFORMANCE : AIKEN VALIDITY. 18(4), 7103–7110.

Yudanto, Suherman, W. S., Nugroho, S., & Guntur. (2022). The effect of game experience learning model and fundamental movement skills on psychosocial skills in youth soccer players. *Journal of Physical Education and Sport*, 22(5), 1227–1233. <https://doi.org/10.7752/jpes.2022.05154>

Yudhistira, D., Siswantoyo, Tomoliyus, Sumaryanti, Tirtawirya, D., Paryadi, Virama, L. O. A., Naviri, S., & Noralisa. (2021). Development of agility test construction: Validity and reliability of karate agility test construction in kata category. *International Journal of Human Movement and Sports Sciences*, 9(4), 697–703. <https://doi.org/10.13189/saj.2021.090413>

Yudhistira, D., & Tomoliyus. (2020). Content validity of agility test in karate kumite category. *International Journal of Human Movement and Sports Sciences*, 8(5), 211–216. <https://doi.org/10.13189/saj.2020.080508>