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Analysis of the Aiken Index of the rhythmic gymnastics skills test model in beginner athletes (Indonesian version)

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ABSTRACT

This study aimed to determine the Aiken validity index of the rhythmic gymnastics skill tests model for beginner athletes in the Indonesian version developed. The validation of the assessment model for rhythmic gymnastics skill tests for beginner athletes (Indonesian version) was conducted using expert judgment involving nine experts. The experts were selected based on the criteria of gymnastics lecturers, gymnastics referees, early childhood experts, and measurement and testing experts. The qualitative data collection stage used the Delphi technique. The results of the Aiken's V analysis were compared with the minimum acceptable criteria in the Aiken's V table (1985) for nine raters, with a maximum score of 4 and a 0.5% level of significance, resulting in a critical value of 0.75. Based on the results, the average value of all indicators in the rhythmic gymnastics skills test for beginner athletes (Indonesian version) is 0.859; therefore, the instrument meets the high standard of Aiken's validity criteria. In conclusion, the rhythmic gymnastics skill test instrument for beginner athletes (Indonesian version) has acceptable validity and can be used to assess the rhythmic gymnastics skills of beginner athletes.

KEYWORDS

Validity; Rhythmic Gymnastic; Skill Test; Beginner Athlete

1. INTRODUCTION

Gymnastics is a productive physical activity to optimize children's growth and development (Armstrong & Relph, 2021). Gymnastics, in general, is a sports discipline that primarily involves the body. It has undergone a series of changes worldwide and its application in relation to the quality of

life. Therefore, it has been included in modern education, particularly in Physical Education (Chávez, 2023; Inglés Martos et al., 2023). Gymnastics movements are very suitable for filling physical education programs. Its movements stimulate the development of components of physical fitness such as muscle strength and endurance from all parts of the body (Gentana et al., 2018). In addition, gymnastics also has the potential to develop basic movement skills, as an important foundation for mastering sports technical skills (Abdollahipour et al., 2015; Jürimäe et al., 2018; Mkaouer et al., 2018).

Rhythmic gymnastics is a special exercise for female athletes that combines aspects of flexibility, strength, speed, accuracy, and beauty that are displayed freely (without tools) or by using tools (ropes, hoops, balls, sticks, and ribbons) accompanied by music (Bobo-Arce et al., 2021; Mkaouer et al., 2018). Rhythmic Gymnastics itself has several elements that must be mastered, namely freehand (without tools), hoop (hoop), rope (rope), clubs (mace), ribbon (ribbon), and ball (ball). Programs for junior groups usually consist of 2 disciplines, each with one type of tool. Senior and junior individual programs usually consist of 4 disciplines Rope (except for senior individuals), hoops, balls, clubs, and ribbons (Riabchenko, 2021).

A gymnast can only input the elements he is good at and present them in a neat sequence as safely as possible with high aesthetic value. Sportive rhythmic gymnastics is a gymnastics sport that is developed from rhythmic gymnastics played by individuals and teams that are competed (Polat, 2018; Purenović-Ivanović et al., 2016). Due to the lack of socialization or marketing of gymnastics, especially rhythmic gymnastics, and the lack of instruction books or manuals for tests of basic technical skills of rhythmic gymnastics, it is difficult to find seeds to become talented athletes (Sulistiyowati et al., 2022). To improve the quality of the seeds for athletes, it would be better to do tests to get talented rhythmic gymnastics athletes at an early age or beginners (Ivanova, 2022; Shigaki et al., 2013). Until now, there has not been found a test for basic technical skills of rhythmic gymnastics, to overcome this problem, the development of a basic skill test for rhythmic gymnastics is aimed at making it easier for coaches and teachers to screen quality seeds for further training to become professional athletes.

The development of a rhythmic gymnastics skill test model for beginner athletes in Yogyakarta is needed to improve athletes' abilities and provide constructive feedback. Currently, the rhythmic gymnastics skill tests used are still subjective and not comprehensive, so an objective and comprehensive test model needs to be developed. Thus, novice athletes can be accurately measured their abilities and given constructive feedback to improve their performance. The development of this

rhythmic gymnastics skill test model also requires training for coaches and novice athletes on the use of the new test model. In addition, adequate facilities and resources are also needed to support the development of rhythmic gymnastics skill tests. With the development of an objective and comprehensive rhythmic gymnastics skills test model, novice athletes in Yogyakarta can improve their abilities and excel at the regional and national levels. Therefore, the development of a rhythmic gymnastics skill test model for beginner athletes in Yogyakarta is very important and needs to be done immediately. With this development, it is hoped that later on, it can increase the seeds of early-age children or beginners to be honed to become professional rhythmic gymnastics athletes and it is hoped that parents will also open their eyes more to rhythmic gymnastics (Almadhkhori et al., 2021).

To understand the development and progress of athletes requires tests to measure the skills of athletes in the form of tests of basic skills of rhythmic gymnastics. The basic skills test of rhythmic gymnastics consists of basic rhythmic gymnastics which contains 3 basic movements of rhythmic gymnastics, namely: balance, jumps / leaps, and rotations/pivots. Currently, rhythmic gymnastics rarely uses basic skills tests to measure the ability of athletes, especially in the Yogyakarta area. Therefore, the ability of rhythmic gymnastics athletes in Yogyakarta is still relatively low. As stated by (Debien et al., 2020; Martínez Rodríguez et al., 2020) rhythmic gymnastics requires a high level of physical quality, therefore good performance depends on muscular strength and endurance, motor coordination, and postural balance. That is why a test of basic skills of rhythmic gymnastics is needed to measure the ability of novice athletes so that later they can be given a portion of the exercise according to their abilities (Montosa et al., 2018).

Rhythmic gymnastics is an artistic and aesthetic sport with a special training process, very young athletes are first specialized before their bones undergo maturation, large volume training, many hours of intensive training per week, number of repetitions, and high level of technical elements performed. In addition, high levels of physical and psychological stress are required in competition. The development of a good rhythmic gymnast requires special knowledge of the sport. The trainers, judges, gymnasts, or other staff involved do not have time to write down the training method and sometimes they do not want to explain it because of competition. That is one reason why there are not many references on this topic (Herlambang, 2017; Ketelaar et al., 2001; Bugler et al., 2019).

The basic techniques that must be learned or mastered for a beginner rhythmic gymnast are regulated by the Federation Internationale de Gymnastique (FIG) in a Code of Points which contains three main body difficulties, namely balance, jumps, and rotation (Leandro et al., 2017). The main

movements of these movements have their respective levels from simple to complex movements which of course have been regulated by FIG in a Code of Points which is frequently updated every 4 years. To test the basic technical skills of rhythmic gymnastics, the movements to be tested or used in the test are rhythmic gymnastic movements based on the Code of Points from FIG, for the test movements to be used are a collection of movements with a value of 0.10 to 0, 30 which is suitable for testing basic technical skills of early childhood or beginners. This study aimed to determine the validity of the rhythmic gymnastics skills test model.

Regarding the achievements in the rhythmic gymnastics branch, continuity is needed between the nursery and the guidance of rhythmic gymnastics talents so that maximum achievement can be achieved. A test or assessment is needed to measure the skill level of gymnastics athletes to find out the results of training. A test is a tool used in obtaining data from an object to be measured. Making tests needs several procedures and rules that must be carried out so that the process can be organized. This means that in the process in a test there is an organized systematic and accompanied by clear implementation rules and scoring methods, so that everyone can understand and carry it out properly and correctly. Making a test needs to pay attention to several things, so that the test can benefit both individuals and groups, especially in rhythmic gymnastics.

Based on observations in the field, until now there seems to be no standardized skill measurement instrument for rhythmic gymnastics with a high level of validity, which can be applied in Indonesia. In such conditions, these instruments cannot necessarily be used for Indonesian sports athletes. The series of tests used in the development of rhythmic gymnastics basic technical skills tests are a collection of movement techniques with scores of 1-4 which are guided by the Code of Points. Code of Points (CoP) is an official guidebook published by the Fédération Internationale de Gymnastique (FIG), which contains rules, scoring criteria, difficulty categories, and technical guidelines in rhythmic gymnastics. It describes the types of basic body difficulties and their values (Chiriac, 2020). Therefore, efforts are needed to adapt, modify, and develop an Indonesian version of rhythmic gymnastics skill instruments that can be used validly so that they can be applied according to Indonesian conditions. The development of rhythmic gymnastics skill tests is needed to support the achievement process. Based on this, the researcher intends to conduct research on the development of rhythmic gymnastics skill tests for beginner athletes in the Indonesian version.

2. METHODS

This research focuses on the development of a rhythmic gymnastics skill test. Assessment of process performance on technical skills, and rhythmic gymnastics skills. The instrument in this study is an adaptation of FIG. In rhythmic gymnastics, the Code of Points (CoP) organizes a scoring system that is divided into three main components: (1) Difficulty (D-Score), Execution (E-Score), and Artistry (A-Score) with points 0.1-0.3. The test to be developed in this study is a test of basic rhythmic gymnastics technique skills consisting of: Balance: Horizontal Freeleg (forward & side), and Arabesque. Jumps: Stretch Jump, Tuck Jump, Scissors forward, and Stag Leap. Rotations: Passe Bendleg, Freeleg Forward, and Freeleg Backward. Scoring based on starting position, execution, and final position with a score of 1-4 points.

Validation of the rhythmic gymnastics skill test assessment model using expert judgment or experts involving nine experts determined based on the criteria of gymnastics lecturers, gymnastics referees, early childhood experts, and measurement test experts. The rater or rater provides an assessment of the rhythmic gymnastics observation rubric. Data analysis was obtained from the rater or rater on the rhythmic gymnastics skills test. The validity of rhythmic gymnastics skills tests is based on expert judgment or gymnastics experts.

The content validity of the rhythmic gymnastics skills test used analysis with Aiken's V, to obtain the amount of validity. The results of the Aiken V analysis were compared with the minimum permissible criteria in Aiken V with 9 raters or assessors at the highest score of 4 with margin eror 0.5% degree of freedom 0.74. The data analysis technique used in this study uses Aiken (Aiken, 1985), using the following formula:

$$\mathbf{V = \Sigma\, s / [n\,(c - 1)]}$$

$$\mathbf{s = r - lo}$$

V = the overall validation average

Σs = the output of the rater score reduced by the lowest score

lo = the lowest validity assessment score

c = the highest validity assessment score

r = the score given by raters

3. RESULTS

The Rhythmic Gymnastics Skills Test Guide was validated by nine (9) experts. Table 1 shows that the contents of the rhythmic gymnastics test guide material for Item 1, evaluated by nine experts,

produced an Aiken's V value of 0.889. Item 2, also evaluated by nine experts, yielded an Aiken's V value of 0.889. Item 3, evaluated by nine experts, showed an Aiken's V value of 0.778. Item 4, evaluated by nine experts, produced an Aiken's V value of 0.852, and Item 5, evaluated by nine experts, also produced an Aiken's V value of 0.852.

Table 1. Aiken test results on the contents of the Rhythmic Gymnastics Test Guide

Rater	Grain				
	1	**2**	**3**	**4**	**5**
1	3-1	4-1	3-1	4-1	4-1
2	4-1	4-1	3-1	3-1	3-1
3	3-1	3-1	3-1	3-1	3-1
4	4-1	3-1	3-1	3-1	4-1
5	4-1	4-1	3-1	4-1	3-1
6	4-1	4-1	4-1	4-1	3-1
7	3-1	3-1	4-1	3-1	4-1
8	4-1	4-1	4-1	4-1	4-1
9	4-1	4-1	3-1	4-1	4-1
∑S	33-9=24	33-9=24	30-9=21	32-9=23	32-9=23
V=∑S/(9{4-1})	0.889	0.889	0.778	0.852	0.852
Average Aiken'V					**0.852**

The average Aiken's V value across the five items was 0.852. When compared with the Aiken's V table (1985) at a 5% margin of error and the corresponding degree of freedom, the critical value is 0.72. Therefore, the instrument is considered to have acceptable content validity. Table 2 shows the content validity results of the technique being evaluated using Aiken's V method.

Table 2. Aiken test results on the appropriateness of the technique demonstrated

Rater	Grain		
	1	**2**	**3**
1	3-1	4-1	3-1
2	3-1	3-1	3-1
3	3-1	3-1	3-1
4	4-1	4-1	3-1
5	4-1	3-1	4-1
6	4-1	4-1	4-1
7	3-1	4-1	4-1
8	4-1	4-1	4-1
9	3-1	4-1	3-1
∑S	31-9=22	33-9=24	31-9=22
V=∑S/(9{4-1})	0.815	0.889	0.815
Average Aiken'V			**0.840**

Table 2 showed that the suitability of the technique demonstrated in point 1 with the assessor or rater 9 experts provides an Aiken'V calculation of 0.815, point 2 with an assessor or rater 9 experts provides an Aiken'V calculation of 0.889, point 3 with an assessor or rating 9 experts provide Aiken'V's calculation is 0.815. The mean of 3 points of suitability of the techniques demonstrated is 0.840, if confirmed by the 1985 Aiken'V table with 5% of 0.78, then the suitability of the techniques demonstrated is said to have validity that meets the requirements. Table 3 shows the content validity evaluation of the images used in the instrument or test based on expert judgment.

Table 3. Aiken test results on item appropriateness of images

Rater	**Grain**		
	1	**2**	**3**
1	4-1	4-1	3-1
2	3-1	4-1	4-1
3	4-1	3-1	4-1
4	3-1	4-1	4-1
5	4-1	4-1	4-1
6	3-1	4-1	4-1
7	4-1	4-1	3-1
8	4-1	4-1	4-1
9	3-1	3-1	4-1
∑S	32-9=23	34-9=25	34-9=25
V=∑S/(9{4-1})	0.852	0.926	0.926
Average Aiken'V			**0.901**

Table 3 shows that the suitability of the image in item 1 with the assessor or rater 9 experts gave Aiken'V calculations of 0.852, point 2 with the assessors or rater 9 experts gave Aiken'V calculations of 0.926, point 3 with the assessors or rater 9 experts gave Aiken calculations 'V is 0.926. The average of 3 points of image suitability is 0.901, if it is confirmed by the 1985 Aiken'V table with 5% of 0.78, then the suitability of the image is said to have validity that meets the requirements. Table 4 shows the content validity of the videos used in the study based on expert evaluations using Aiken's V method.

Table 4. Aiken test results on video conformity points

Rater	Grain				
	1	**2**	**3**	**4**	**5**
1	3-1	4-1	3-1	4-1	4-1
2	4-1	4-1	3-1	3-1	3-1
3	3-1	3-1	3-1	3-1	3-1
4	4-1	3-1	3-1	3-1	4-1
5	4-1	4-1	3-1	4-1	3-1
6	4-1	4-1	4-1	4-1	3-1
7	3-1	3-1	4-1	3-1	4-1
8	4-1	4-1	4-1	4-1	4-1
9	4-1	4-1	3-1	4-1	4-1
∑S	33-9=24	33-9=24	30-9=21	32-9=23	32-9=23
V=∑S/(9{4-1})	0.889	0.889	0.778	0.852	0.852
Average Aiken'V					**0.852**

Table 4 showed that the suitability of the video in point 1 with the evaluator or rater 9 experts gave an Aiken'V calculation of 0.889, point 2 with an appraiser or rater 9 experts gave an Aiken'V calculation of 0.889, point 3 with an assessor or rater 9 experts gave Aiken calculations 'V is 0.778, item 4 with an assessor or rating of 9 experts gives an Aiken'V calculation of 0.852, item 5 with an assessor or rating of 9 experts gives an Aiken'V calculation of 0.852. The average of 5 items of video suitability is 0.852, if it is confirmed by the 1985 Aiken'V table with 5% of 0.72, it is said to have validity that meets the requirements.

Table 5 shows the content validity evaluation of the writing quality and grammar used in the instrument or material based on expert judgment using Aiken's V method.

Table 5. Aiken test results on writing points and grammar

Rater	Grain			
	1	**2**	**3**	**4**
1	3-1	3-1	3-1	4-1
2	3-1	3-1	3-1	3-1
3	3-1	3-1	4-1	4-1
4	4-1	4-1	3-1	4-1
5	4-1	3-1	3-1	4-1
6	4-1	4-1	4-1	4-1
7	4-1	4-1	4-1	3-1
8	4-1	4-1	4-1	4-1
9	3-1	4-1	3-1	3-1
∑S	32-9=23	32-9=23	31-9=23	33-9=24
V=∑S/(9{4-1})	0.852	0.852	0.815	0.889
Average Aiken'V				**0.852**

Table 5 showed that the writing and grammar in point 1 with the assessor or rater 9 experts gave an Aiken'V calculation of 0.852, point 2 with an appraiser or rater 9 experts gave Aiken'V calculations of 0.852, point 3 with an appraiser or rater 9 experts gave Aiken'V calculation is 0.815, point 3 with an appraiser or rater 9 experts gives an Aiken'V calculation of 0.889. The mean of 4 writing and grammar items is 0.852, if it is confirmed by the 1985 Aiken'V table with 5% of 0.74, then the suitability of the grammar is said to have validity that meets the requirements.

The results of the Aiken's V analysis for the rhythmic gymnastics skills test for beginner athletes (Indonesian version) are presented in Table 6.

Table 6. Aiken'V analysis of the rhythmic gymnastics skills tests for beginner athletes in the Indonesian version

No	Indicator	Aiken'V
1	Test Guide	0.852
2	Appropriateness of the Technique Demonstrated	0.840
3	Item Appropriateness of Images	0.901
4	Video Conformity Points	0.852
5	Writing Points and Grammar	0.852

Based on these results, the average value of all indicators in the rhythmic gymnastics skills test for beginner athletes (Indonesian version) is 0.859; therefore, the instrument meets the high standard of Aiken's validity criteria. Aiken'V close to 1 (≥ 0.80) indicate high content validity, meaning that the item is considered highly relevant and representative of the concept being measured. A low Aiken'V (≤ 0.4) indicates low content validity, meaning that the item is considered less relevant or does not represent the concept being measured (Utami et al., 2024).

4. DISCUSSION

The conceptual framework that will be applied is by recording new athletes and novice gymnasts and then carrying out a series of existing tests. The series of tests used in the development of the basic technical skills test of rhythmic gymnastics is a collection of movement techniques with a value of 0.1 - 0.3 which is guided by the Code of Points the selected movements were agreed upon by the researcher and the coach prior to testing.

The development of a rhythmic gymnastics skill test model for beginner athletes in Yogyakarta is needed to improve athletes' abilities and provide constructive feedback. Rhythmic gymnastics itself is a sport that requires high technical and artistic skills, so it is important to monitor the progress of novice athletes early on. By focusing on rhythmic gymnastics, novice athletes can

develop motor skills, creativity and self-expression that are highly beneficial to their overall development. In addition, rhythmic gymnastics can also help improve self-confidence, discipline and teamwork, which are crucial for novice athletes to achieve future success. Therefore, the development of an objective and comprehensive rhythmic gymnastics skill test model is essential to monitor the progress of novice athletes and provide constructive feedback to improve their performance.

Currently, the rhythmic gymnastics skill tests used are subjective and not comprehensive, so an objective and comprehensive test model needs to be developed. Thus, novice athletes can have their abilities accurately measured and be given constructive feedback to improve their performance. The development of this rhythmic gymnastics skill test model also requires training for coaches and novice athletes on the use of the new test model, as well as adequate facilities and resources to support the development of rhythmic gymnastics skill tests. Thus, novice athletes in Yogyakarta can improve their abilities and excel at regional and national levels.

Some research development tests on gymnastics focus more on artistic gymnastics. Research that has been conducted by Šalaj et al. (2019) examines the content validity, reliability, and validity of the test construct for dive roll in artistic gymnastics. Another study regarding the development of tests on gymnastics is research from (Mkaouer et al., 2018) regarding Evaluating the physical and basic gymnastics skills assessment for talent identification in artistic gymnastics proposed by the International Gymnastics Federation. This study also focuses on developing an assessment for artistic gymnastics. From several other studies regarding the development of tests and measurements in gymnastics, the majority focus on the physical, while the skills are artistic (Barker-Ruchti et al., 2017; Gantcheva et al., 2021).

Furthermore, it is known that the determination of the validity and reliability of the instrument is a complex process, both of which depend on its purpose, on the interpretation of the results proposed by the instrument, and on its use. In general, validity refers to how well an instrument measures what it is supposed to measure (Almeida Lima Júnior et al., 2023; Piñeiro-Cossio, Pérez-Ordás, Bermejo-Martínez, Alcaráz-Iborra, & Nuviala, 2023). With this, it can be said that the rhythmic gymnastics skill test model on average has a high validity value, so it is feasible to apply to novice athletes.

With high validity, this rhythmic gymnastics skill test model can have significant practical implications for coaches and sports federations. Coaches can use this test model to accurately

monitor the progress of novice athletes and provide constructive feedback to improve their performance. In addition, sports federations can also use this test model to conduct more objective and accurate athlete selection, as well as monitor the progress of athletes nationwide. Another practical implication is that this rhythmic gymnastics skill test model can be used as a national standard for measuring the abilities of novice athletes, thus improving the quality of rhythmic gymnastics training and competition in Indonesia. Thus, novice athletes in Yogyakarta and throughout Indonesia can improve their abilities and excel at national and international levels.

5. CONCLUSIONS

Due to the lack of books that discuss gymnastics, especially rhythmic gymnastics, the researcher aims to introduce the book "Rhythmic Gymnastics Basic Technique Skills Test" as a learning medium. This book is expected to facilitate trainers, teachers, and children in learning the basic techniques of rhythmic gymnastics. The current process of filtering rhythmic gymnastics talent seems to be neither optimal nor efficient. Therefore, the researchers aim to develop the basic technical skills test for rhythmic gymnastics to make the selection process for prospective rhythmic gymnastics athletes more accurate. The results showed that the Aiken's V analysis of the rhythmic gymnastics skills test instrument was 0.859. It can be concluded that the rhythmic gymnastics skills test instrument has validity that meets the required standards. However, the validity level is not supported by the reliability value, so the test needs to be re-analyzed to get the requirements for compiling a minimum test, which is proven to be valid and reliable.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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