

A Development of Aerobic Gymnastics Flexibility Test for the National Development Category: A Construct of Content Validity and Reliability Approach

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Abstract Background: Test instrument for flexibility is indispensable in several sports in the national development category, including aerobic gymnastics. However, the fact shows that no aerobic gymnastic flexibility test instrument is yet in the national development category. Purpose: This study aimed to examine the validity and reliability of the aerobic gymnastic flexibility test in the national development category. Design/ methodology/ approach: This research is a research & development supported by qualitative and quantitative approaches. The data collection was carried out with the Delphi technique, involving ten experts. The data analysis used Aiken's to test the validity and Cronbach alpha and Intraclass Correlation Coefficients (ICC) to test the reliability between raters. Results: The results show that the value of all items' Aiken's coefficient was above 0.70, so it can be said that all items were valid. With the Cronbach's Alpha value showed 0.919 and ICC showed 0.911, and each rater consistency was 0.507, it can be said that the instrument was very reliable. Conclusion: Therefore, it can be concluded that aerobic gymnastic flexibility test instrument in the national development category has high content validity and an excellent agreement between raters, with the consistency of each

rater also quite well. For the test instrument to be much more precise, it is suggested to conduct empirical validity tests and reliably test-retests for athletes or non-athletes of the Age Group 1 category for 12-14 years old and Age Group 2 for 15-17 years old.

Keywords Flexibility Test, Aerobic Gymnastics, National Development

1. Introduction

Aerobic gymnastics is a sport with complex and high-intensity movement skills, with patterns that refer to music [1,2]. Aerobic gymnastics belongs to the discipline of sports that are carried out with maximum intensity, with a competition duration setting of 1 minute 30 seconds with a time tolerance of ± 5 seconds [3]. Aerobic gymnastics requires good physical abilities to achieve maximum achievements in every appearance [4]. The physical elements used in this sport are very complex, with almost all components of the bio-motor involved. One of the main physical components that support the performance of

aerobic gymnastics athletes is flexibility [5–8].

Flexibility is an important issue as a parameter for performance in aerobic gymnastics [2,9,10], and has always been considered as the ability to perform the broadest possible movement in the wiggle room of the joints and is supported by and depends on the elasticity of muscles, tendons, and ligaments without resulting in injury [11]. Flexibility refers to the intrinsic nature of body tissues that determine the maximum range of motion of the joints without causing injury [12]. Muscle elasticity can be improved through stretching exercises and training that involves the strength component. However, this physical component of flexibility is often ignored by coaches. The coaches do not remind or provide an understanding of the importance of flexibility movements, which results in many players or athletes do not do this exercise well. This situation is worsened by the too complicated training model the coaches use to train their athletes.

In aerobic gymnastics, flexibility is used to perform basic and advanced movements to embellish movements where the flexibility and beauty factors are essential in aerobic gymnastics assessment. It is because flexibility plays a vital role in achieving victory in aerobic gymnastic competitions [13]. Flexibility can be measured using instruments with functions to identify, assess, and evaluate.

As an inseparable whole, assessment and evaluation are critical to be carried out in sports achievements such in aerobic gymnastics [14]. Training is said to be good if the assessment tools are also good. Likewise, a good assessment will encourage athletes to train more [15]. 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 [16]. Thus, it is necessary to have aerobic gymnastics coaching from an early age to get optimal achievements. In this coaching, a measuring instrument is crucial to identify children's talents that suit the characteristics of the sport and the athletes or any other potential instrument users.

A flexibility test is needed to improve the flexibility aspect of aerobic gymnastics. Based on the literature, there are only general field-based flexibility tests such as sit-and-reach test; hip flexion test, static flexibility test ankle, and trunk flexion test [17–19]. The previous tests are suitable for knowing the initial ability. Far from this point, very few in-depth studies related to flexibility tests had been developed, especially for aerobic gymnastics in the national development category that suits the athlete needs and the characteristics of aerobic gymnastic sports.

The development of an aerobic gymnastic flexibility test in the national development category is still rare. Specific flexibility test constructs are primarily found in rhythmic gymnastics [20,21]. Therefore, it is necessary to develop a flexibility test with a validity and reliability approach to the construction in the national development category according to the athlete needs in aerobic gymnastics sports and its characteristics. In this study, researchers developed

the flexibility test construction on aerobic gymnastics for the national development category with children aged 9-11 years.

Validity has several types, namely, the validity of criteria, the validity of the construct, and the validity of the contents [22,23]. In this study, validity and reliability measured the content validity and the aerobic gymnastic flexibility test reliability in the national development category that the researchers have designed. Content validity can be used to refer to the extent to which the content of the measuring instrument is considered capable of measuring things that represent the entirety of the material to be evaluated [24–27]. At the same time, reliability is the level of accuracy of a measuring instrument in a measurement procedure [28].

2. Materials and Methods

This research applied research and development methods supported by qualitative and quantitative approaches to make it able to examine further [29–31]. The study involved nationally licensed gymnastics aerobic coaches, three physical condition experts, and three primary school GYM teachers. The expert sports teacher in this study aimed to evaluate and measure athletes' ability in cases of the constructiveness of this flexibility test. Later, the test can also be used as an identification tool for non-athlete talent such as elementary school students.

The data analysis on the construct validity of the flexibility test used the content validity. The study used four steps to validate the content. First, the authors gathered relevant research resources and conducted participatory observational studies as an introduction development. Second, the seven experts conducted a product assessment using the Delphi technique to get a consensus from the expert based on the questionnaire results with an assessment scale of 1-5 [32]. The third step is to analyze the data obtained in quantitative terms from the assessment of ten experts using Aiken's V formula [33].

At the same time, the researchers used advice from 10 experts to analyze the data qualitatively. The researchers used 10 raters, category numbers 1-5, and a 5% confidence level to conclude from the calculation results of Aiken's V based on the V table. The result is declared valid if the V count is greater than the V of the table, of which V of the table is 0.70 [33].

Finally, the last step is the data analysis technique for the reliability test of the flexibility test instrument developed by the researchers using Cronbach's Alpha [34] and Intraclass Correlation Coefficients (ICC) [35] with the help of SPSS application version 25. The conclusion for the reliability test using Cronbach's Alpha is that with $n=10$, the table's R-value at a significant level of 5% is 0.632. The ICC is based on the categorization of the following formula [35]:

Table 1. ICC Value Category

ICC Value	Interpretation
0.00 - 0.50	Poor Reliability
0.51 - 0.75	Moderate Reliability
0.76 – 0.90	Good Reliability
0.91 – 1.00	Excellent Reliability

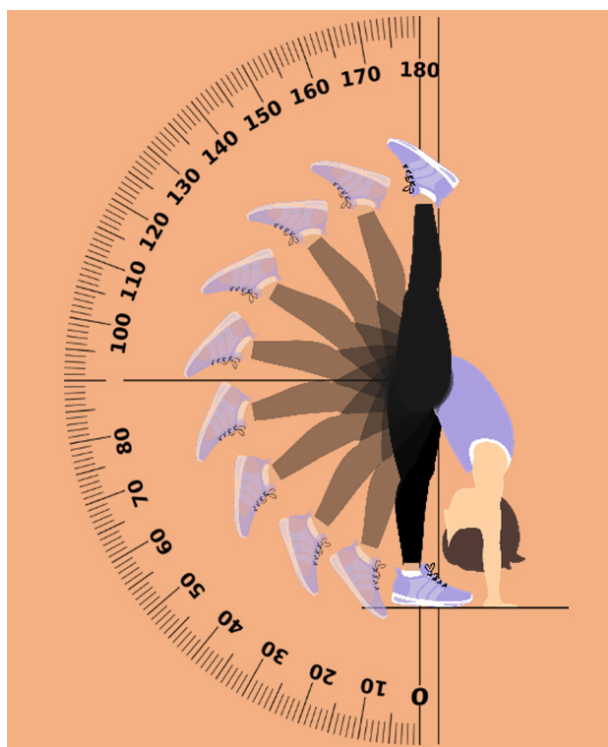


Figure 1. Flexibility Test Construction

3. Result

Based on the literature review of several documents such as relevant articles, journals, and textbooks, the

construction of the aerobic gymnastic flexibility test for the national development category can be seen in figure 1.

3.1. Aerobic Gymnastic Test Construction in National Development Category

Test Implementation Instructions

- The athlete stands upright, positioning his/her back to the image of the bow.
- After the cue “yes,” the child bends down, palms stick to the floor, and hands and feet stick as close as possible.
- Lift one of the legs as maximum as the athlete can.
- Conduct the test twice.
- Record the best degree value.

Tools needed

- A giant image of the bow.
- Paper and pen for taking notes.

The greater the degree obtained, the higher the score will be. The scoring table is presented as follows:

Table 2. Range of aerobic gymnastic flexibility test scores

Range of Values	
Value	Degree
0	0-20
1	21-40
2	41-60
3	61-80
4	81-100
5	101-120
6	121-140
7	141-160
8	161-180

Table 3. The analysis results of the Aiken Formula

Jury	Item 1		Item 2		Item 3		Item 4		Item 5		Item 6		Item 7		Item 8		Item 9		Item 10		Item 11		Item 12	
	Score	S	Score	S	Score	S	Score	S	Score	S	Score	S	Score	S	Score	S	Score	S	Score	S	Score	S	Score	S
A	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	5	4	5	4	4	3	4	3
B	4	3	4	3	3	2	4	3	4	3	4	3	4	3	4	3	5	4	5	4	4	3	5	4
C	4	3	4	3	4	3	4	3	5	4	4	3	4	3	4	3	5	4	5	4	4	3	4	3
D	4	3	5	4	5	4	4	3	5	4	4	3	4	3	4	3	5	4	5	4	4	3	4	3
E	4	3	5	4	5	4	4	3	4	3	4	3	4	3	5	4	5	4	5	4	4	3	5	4
F	4	3	5	4	4	3	4	3	4	3	4	3	4	3	5	4	5	4	5	4	4	3	5	4
G	4	3	5	4	5	4	4	3	5	4	4	3	4	3	5	4	5	4	5	4	4	3	4	3
H	4	3	5	4	5	4	4	3	5	4	4	3	4	3	5	4	5	4	5	4	4	3	5	4
I	4	3	4	3	5	4	4	3	5	4	4	3	4	3	5	4	5	4	5	4	4	3	5	4
J	4	3	4	3	4	3	4	3	4	3	4	3	4	3	5	4	5	4	5	4	4	3	5	4
Σs	30		35		34		30		35		30		30		36		40		40		30		36	
V	0.75		0.88		0.85		0.75		0.88		0.75		0.75		0.90		1.00		1.00		0.75		0.90	

3.2. Content Validity

Based on table 3, item 1 shows the value of the Coefficient of Aiken's V of 0.75; item 2 indicates the value of the coefficient of Aiken's V of 0.88; item 3 indicates the value of the coefficient of Aiken's V of 0.85; item 4 indicates the value of the coefficient of Aiken's V is 0.75; item 5 shows the value of the Aiken's V coefficient of 0.88; item 6 shows the value of the Aiken's V coefficient of 0.75; item 7 shows the value of the Aiken's V coefficient of 0.75; item 8 indicates the value of the coefficient Aiken's V of 0.90; items 9 and 10 show the value of the Aiken's coefficient V of 1.00; item 11 indicates the value of the Coefficient of Aiken's V of 0.75; and item 12 indicates the value of the coefficient of Aiken's V of 0.90. Thus, it can be concluded that the value of Aiken's coefficient V in the flexibility test on the whole item is declared valid since the calculated V is greater than the table V (0.70)

3.3. Reliability

The results of the reliability test between raters using Cronbach's Alpha are presented in table 4 as follows:

Table 4. Cronbach alpha analysis result

N	R-table (5%)	Cronbach Alpha	Status
10	0.632	0.919	Reliable

The reliability test using Cronbach's Alpha obtained an r-table of 0.632 and the Cronbach's Alpha value of 0.919. Therefore, the result is reliable when the C value of Cronbach's Alpha is greater than the r-table. Thus, the aerobic gymnastic flexibility test instrument for the national development category is declared reliable.

The results of the interrater agreement test or interrater reliability using Intraclass Correlation Coefficients (ICC) are presented in table 5.

Based on table 5, the average agreement between raters is 0.911, while for each person, the rater consistency is 0.507. The results of the ICC value according to [35] fall into the category of excellent reliability. Therefore, it can be concluded that the agreement between the raters is very

strong, and each assessor has sufficient consistency well.

4. Discussion

This study focused on test instruments developed for aerobic gymnastics in the national development category to measure the flexibility of aerobic gymnastics in the national development category. The researchers have adjusted the instrument based on the characteristics of sports and the athlete.

The physical component is one of the essential elements for gymnasts to achieve maximum achievement [36]. Aerobic gymnastics is a sport that needs a good physical condition to produce effective and efficient movements [37]. Flexibility is one of the dominant physical aspects of aerobic gymnastics. Flexibility is the body's ability to perform the broadest possible movement in the space of the joints movement and is supported by and depends on the elasticity of muscles, tendons, and ligaments without injury [38].

Flexibility is the extent of movement of one joint or several joints [39]. One of the unique characteristics of the gymnast is that it has good flexibility in almost all its joints, which results in a gymnast being able to perform bent, kissing the knees, splits, and so on. The low flexibility results in not being able to perform those movements well. Flexibility consists of static flexibility, determined by the size of the range of motion of one joint or several joints, and dynamic flexibility, which is a person's ability to move at high speed. Therefore, the movement of flexibility is a crucial point in aerobic gymnastics. This is supported by several kinds of literature stating that performing movements quickly and flexibly is a necessary multifactor movement that serves to improve motor skills and posture stability, not easily injured, and contributes to the improvement of sports performance [40-42].

Gymnasts are individuals who are required to have an excellent physical condition in order to win the competition. A person's success in winning a race does not come solely from innate talent. Gymnasts should practice hard with the right program and good evaluation.

Table 5. Intraclass Correlation Coefficient analysis result

	Intraclass Correlation ^b	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.507 ^a	.303	.763	12.296	11	99	.000
Average Measures	.911 ^c	.813	.970	12.296	11	99	.000

Gymnasts have different characteristics, from gymnasts at the level of children, adolescents, adults, and professional gymnasts. The coach must apply the correct approach to improve the achievements of his protégés to know their characteristics. For example, for measurement and evaluation, the coach must be able to determine the test instruments used to evaluate the abilities of athletes and their students correctly. In this study, it was prioritized for gymnasts aged 9-11 years in the national development category. Therefore, testing is needed to follow the characteristics of the national development category to improve their skills and motivation. Thus a test is required that corresponds to the characteristics of each branch and the characteristics of the child [43,44].

Based on the Aikens analysis used to measure the validity of the contents, the following results were obtained: item (1), gymnastic aerobic flexibility test is appropriate for children in the national development category with a V value of 0.75; item (2), the size has been appropriate in the aerobic gymnastics category of national development with a value of V 0.88; item (3), the altitude between degrees has corresponded to the value of V 0.85; item (4), the equipment used motivates the gymnast category national development with a value of V 0.75; item (5), this instrument multiplies the number of repeats of the test that have been completed with a value of V 0.88; item (6), the test procedure has corresponded to the value of V 0.75; item (7), the easy test instrument understood by gymnasts category national development with a value of V 0.75; item (8), the test instrument can be used for the measurement of flexibility with a value of V 0.90; item (9), the flexibility test which has already developed fictitious speciation with a value of V 1.00; item (10), accuracy of the concept of measurement and appraisal with a value of V 1.00; item (11), range of values of the designed flexibility test has been suitable with the V value of 0.75; and item (12), this test model can help the coaches and teachers to identify aerobic gymnastics talents in the national development category with a value V 0.90. According to the Aikens table [33], if V counts greater than V, the table (0.70) is declared valid. Thus, it can be concluded that the value of Aiken's coefficient V on the construct of the flexibility test on the entire item is valid and worthy of use.

The reliability testing of every aspect of the aerobic gymnastic flexibility test instrument was measured using Cronbach's Alpha, showing the results of 0.919. Cronbach's Alpha is a measure of reliability that ranges in value from zero to 100. According to [45], the minimum Cronbach's Alpha reliability level value is 0.70. if the value of Cronbach's Alpha > 0.7, then the aspects of the aerobic gymnastic flexibility test instrument of the national development category are very reliable. The degree of reliability can also be seen from the r-table value, for which the value of Cronbach's Alpha must be greater than the value of the r-table. In this study, the Cronbach's alpha value was 0.919, while the r-table was 0.632.

Meanwhile, to test the reliability between raters

(agreement between raters) and the consistency of each rater, this study used Intraclass Correlation Coefficients (ICC) analysis because the number of raters is more than two. In other words, some raters assess the construction of the flexibility test instrument for aerobic gymnastics through the rating instrument. The ICC analysis has shown that the average agreement between raters is 0.911, while for one person, the consistency rater is 0.507. According to Portney and Watkins [35], when the category of the value of the agreement between the raters is above 0.00-0.50, it is declared as poor agreement; when the value is above 0.51-0.75, it is declared as moderate agreement; when the value is above 0.76-0.90, it is declared as good agreement; and when the ICC value is 0.91-1.00, it is declared as very good (excellent). Based on the ICC results (table 5), it can be concluded that the agreement between the raters is very strong, and each rater has a reasonably good consistency (moderate reliability). Therefore, the construction of the test was considered feasible to measure the aerobic flexibility of the gymnastics of the national development category. This developed test is an adapted or specified test with techniques in aerobic gymnastics because this test is similar to the movement of the technique at the time of the race.

Lastly, from the results and discussion based on qualitative and quantitative approaches, it can be said that the aerobic gymnastic flexibility test instrument in the national development category has high content validity and the average agreement between raters is very good with consistency of each rater is also quite good.

5. Conclusions

Based on the results and discussion, it can be concluded that the construct of the aerobic gymnastic flexibility test in the national development category is considered valid and reliable. Therefore, this instrument can be used to measure the flexibility of athletes and non-athlete aerobic gymnastics. It is recommended to conduct empirical validity tests and reliably retest tests for athletes or non-athletes of the Age Group 1 category for 12-14 years old and Age Group 2 for 15-17 years old to make this test instrument more precise.

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