Validity and Realiability od AISIRE to Measure the Reaction Speed of Upper Elementary School Students

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Article Info

Abstract

Simple Innovation Tools for Reaction Indications (named AISIRE) is an instrument to measure reaction speed of Elementary School students Grade 4, 5, 6 or known as upper Elementary School. A good instrument must have validity and reliability that meet statistical criteria. The purpose of this study was to determine the validity and reliability of AISIRE, specifically to find out if AISIRE could be used as an instrument to measure the reaction speed of upper Elementary School students. The research method used descriptive research method with a quantitative approach. The participants participated in this study were 78 students (39 males and 39 females) at the upper level of Elementary School selected using incidental sampling technique. The data collection technique employed a test with AISIRE as the research instrument. The data analysis technique used correlation test, Norm Referenced Evaluation, and Criterion Referenced Evaluation. This study concludes that AISIRE can be used as an instrument in measuring the reaction speed of upper Elementary School students. ASIRE can meet the validity and reliability according to statistical criteria. Further research regarding distance in AISIRE and instrument development utilizing the development of existing technology is needed.

INTRODUCTION

Physical Education Sport and Health subject, known as PJOK, is one of the subjects delivered in Elementary Schools. Good learning criteria, according to the Education Unit Level, show that textbooks as a single source is not enough, teachers should be equipped with other tools or media (Wijaya & Kanca, 2019). Through the use of learning media, the inculcation of concepts, principles, and theory of PJOK lessons, which is initially felt difficult by students, will be easier if using learning media, because PJOK lessons should be delivered in practice and real situation, so that students can well understand and digest the material presented (Herlina & Suherman, 2020).

In this globalization era, not all people can utilize the rapid sophistication of technology, especially students living in the remote area. The lack of facilities and infrastructure is a classic factor that is often experienced, as well as the assistance from the government which has not yet been evenly distributed related to the construction of educational facilities and infrastructure. This situation requires an immediate solution.

The implementation of PJOK learning must be carried out in an innovative creative way providing opportunities for students to be directly involved in various learning experiences through physical activity. Learning media is a component in teaching and learning activities aimed to increase understanding of the subject matter being studied. Innovation of using teaching aids is one of the effective learning media selections that can increase the student interest in learning. One of the learning media is the teaching aids (Harefa, 2021).

One of the efforts to provide the media is by creating unique and interesting media/property innovations to assist teacher in delivering material during the teaching and learning process. For this reason, the researcher created an innovation development design called Simple Innovation Tools for Reaction Indication, named AISIRE, to measure children' fitness levels, especially their reaction speed aspect. In addition, the production of this media does not require high costs and has economic value, while the material is easy to be found around us.

In the early stage of AISIRE production, the researchers used colored cards (red, yellow, green, and blue) and pegs with colored balls on its top (red, yellow, green, and blue). To use the instrument, the students should stand in the middle of a square area marked by a peg with colored ball on its top with a 4-meter distance among the pegs. When the researcher lifted the colored card, the student in the middle of the square moved as quickly as possible to hold the peg with the suitable ball color according to the color of the card that the researcher lifted, then the student returned to the center to prepare to move back according to the colored card that the researcher lifted in 30 seconds. From the results obtained, the researcher felt that it was less effective because the researcher had to lift the card and sometimes the students saw the card that the researcher took before making the movement.

Therefore, the researcher prepared a simple tool so that students could move without any cues from the researcher, namely AISIRE. AISIRE is made of used mineral water bottles filled with soil/ cement, colored dice (red, yellow, green, and blue), springs as the dice propulsion device placed on top of used mineral water bottles filled with soil/cement, and pegs with colored balls placed on its top (red, yellow, green, and blue). The details can be seen in **Figure 1.** To use the instrument, the students should stand in the middle of a square area with the AISIRE tool, placed in the middle, near students stepping on a 30-centimeter square line. The distance among the pegs was 4 meters. When the researcher

gave the signal "YES", or blowing a whistle, the students shake the AISIRE tool and saw the color of the dice, then the student moved as quickly as possible to hold the peg with the suitable colored ball according to the color appearing from the AISIRE tool and returned to the center of the box to prepare to move again by first shaking the AISIRE for 30 seconds.

Figure 1. AISIRE Tool

The results of initial observations to 11 Elementary School students in Grade 5 (6 boys and 5 girls) show that AISIRE was more preferable to using cards. Besides that, they also said that AISIRE was interesting, unique, weird, simple, good, funny in shape, fun, easy to play, and confusing because they were not familiar with the dice roll. From these positive and negative opinions, there were many positive opinions from test participants. Moreover, from the results of initial observations, several groups and colleagues suggested that the tool should be improved and measured for its validity and reliability because AISIRE can be used as an instrument to measure a child's fitness level, especially their reaction speed.

In developing an instrument, it is necessary to pay attention to several aspects, such as the validity and reliability of the instrument (Ginanjar 2019; 2021). Validity measures what is to be measured so that the test is appropriate to measure the indicators being measured (Ginanjar 2021). While reliability describes the degree of constancy or consistency of the measuring instruments against the same object and subject where

the results are relatively the same (Ginanjar 2021).

AISIRE is intended to help achieve the Basic Competence of the curriculum structure of Grades 4, 5, and 6 of Elementary School students, who belong to upper level of Elementary School. Basic Competence in the 4th, 5th, and 6th Grade of Elementary School curriculum structure includes the physical fitness aspect (Permendikbud No. 67 Tahun 2013). In the odd semester Learning Plan, there is physical fitness subject matter where several physical fitness elements cannot be carried out, one of which is reaction speed.

Reaction speed is the time taken between the emergence of a stimulus from the beginning of the reaction (Nurhasan and Cholil 2014). Furthermore, reaction speed or reaction time is the speed of movement and agility related to fitness (Moradi and Esmaeilzadeh 2015). Reaction time is one of the most important elements in sports and needs to be tested (Eckner et al. 2014).

The results of previous studies show that reaction speed is measured in tests for athletes using whole body reactions (Fakhi and Berlian 2019; Pratiwi and Prayoga 2019). In martial arts athletes, sound and color are used (Samodra 2021). At university level athletes, clinical test of reaction time is used (Eckner et al. 2014). For students aged 9-12 years in Iran, a 4 X 10 meter shuttle run is used (Moradi and Esmaeilzadeh 2015). From some of the results of these studies, most of the tests were carried out on athletes and on students aged 9-12 years and did not provide the level of validity and reliability of the tests used.

This study measured the AISIRE instrument test on Elementary School students Grade 4, 5, and 6 to measure reaction speed. Thus, this study aimed to determine the validity and reliability of AISIRE, specially to find out if AISIRE could be used as an instrument for measuring the reaction speed of the upper-level students of Ele-

mentary School. In addition, this study also provided a description of the assessment criteria so that AISIRE can be used as a reference for assessment in PJOK subject and extracurricular lessons related to sports that can be adapted to sport extracurricular requiring a reaction speed assessment. It is in line with the opinion stating that reaction time is one of the important elements in sports and needs to be tested (Eckner et al. 2014).

METHODS

This study employed descriptive research method focused on testing instruments to measure the reaction speed of upper Elementary School students. This research used descriptive research method with quantitative approach. Quantitative descriptive method is a research method explaining the object studied related to the variables used and uses numbers in data collection, data interpretation, and the results of the research (Ginanjar 2019).

Population

The population consisted of 4th, 5th, and 6th Grade Elementary School students in an Elementary School in Banten province, consisting of 134 students (68 males and 66 females). The participants of the study were 78 students (39 males and 39 females). Since this study was conducted during the enforcement of Community Activity Restrictions due to the Covid-19 pandemic, the participant selection was carried out using incidental sampling technique. Incidental sampling comes from the necessity or spontaneity, thus anyone with appropriate characteristics who coincidentally met the researcher became the sample (Ginanjar 2019). The average age of the participants was 10.62 with an age range of 9-13 years. The average age of Grade 4 Elementary School students was 9.92 with an age range of 9-10 years. The average age of Grade 5 Elementary School students was 10.24 with an age range of 10-11 years. The

average age of Grade 6 Elementary School students was 11.46 with an age range of 11-13.

Data Collection Technique

The data collection technique, because it tested the instrument to measure the reaction speed of upper Elementary School students included the psychomotor aspect, used a test. The test used was a reaction speed test called AISIRE.

Data Analysis

The data analysis technique used the Pearson Product Moment correlation test. To test the validity and reliability of the movement test, the Wherry Doolite method using a composite score was used for testing the validity and the test-retest were conducted for testing the reliability (Ginanjar 2021). To determine the assessment criteria, the Norm Reference Evaluation was used so that the Minimum Completeness Criteria could be determinded using a scale of 10 (Ginanjar 2021). Meanwhile, to determine the assessment criteria, the Criterion Reference Evaluation was used so that the assessment in the form of numbers, letters, and categories used a five-point scale (Ginanjar 2021).

RESULT AND DISCUSSION
Initial Study

The initial observations and research objectives were aimed to determine the validity and reliability of AISIRE for upper elementary school students. The study was conducted on 78 students of the 6th Grade elementary school (39 males and 39 females) by increasing the variation of the AISIRE distance into 3, 4, and 5 meters. The average age of the participants was 11.44 with an age range of 11-12 years. The average age of male participant was 11.55 and the average age of female participant was 11.37.

The results obtained in male students at a 3-meter distance show the validity of

0.804 and reliability of 0.568. At a 4-meter distance, the validity was 0.842 and the reliability was 0.391. At a 5-meter distance, the validity was 0.839 and the reliability was 0.273. The details can be seen in table 1.

Table 1. Results of AISIRE Validity and Reliability Initial Study for Male

	Validity	Reliability
Three meters	0,804	0,568
Four meters	0,842	0,391
Five meters	0,839	0,273

Table 1 shows that the validity value is > 0.700 while the reliability value is < 0.700. The validity and reliability of a good instrument should be > 0.700 (Ghozali 2015; 2017). According to this statement, the closest reliability value to 0.700 was found at the 3-meter distance. Therefore, the researcher has a strong assumption that, in using AISIRE for measuring reaction speed, 3-meter distance is better for male students.

The results obtained for female students show that, at the 3-meter distance, the validity was 0.888 and the reliability was 0.656. At the 4-meter distance, the validity was 0.915 and the reliability was 0.659. At the 5-meter distance, the validity was 0.891 and the reliability was 0.637. The details can be seen in table 2.

Table 2. Results of AISIRE Validity and Reliability Initial Study for Female

	Validity	Reliability
Three meters	0,888	0,656
Four meters	0,915	0,659
Five meters	0,891	0,637

Table 2 presents that the validity value is > 0.700 while the reliability value is < 0.700. According to the results of validity and reliability tests, the closest value to 0.700 was the 4-meter distance. Therefore, the researcher has a strong assumption that, in using AISIRE for measuring reaction speed, 4-meter distance is better for female students.

Second Study

The initial observations and preliminary studies present that, in using AISIRE, 3-meter distance was suitable for men and 4-meter distance was suitable for female. The results of the analysis are relevant to the research objectives to determine the validity and reliability of AISIRE. For upper Elementary School male students involving 39 students (13 4th Grade male students, 13 5th Grade male students, and 13 6th Grade male students), at the 3-meter distance, the validity was 0.933 and the reliability was 0.792. The 4th Grade male students obtained validity 0.931 and reliability 0.750. For the 5th Grade male students, the validity was 0.946 and the reliability was 0.818. For the 6th grade male students, the validity was 0.891 and the reliability was 0.741. The details can be seen in table 3.

Table 3. AISIRE Validity and Reliability Results for Male Students

	Validity	Reliability
Male Upper Elementary School Students	0,933	0,792
4th Grade	0,931	0,750
5th Grade	0,946	0,818
6th Grade	0,891	0,741

Table 3 shows that the validity and reliability values exceed 0.700 so that AISIRE is considered as valid and reliable instrument for measuring reaction time for male students. Therefore, AISIRE can be used both in PE class and in extracurricular activities related to the reaction speed of upper Elementary School students. The AISIRE assessment criteria in PE class subject and extracurricular activities are de-

scribed in table 4 and table 5.

Table 4. AISIRE Assessment Criteria in PE Class for Male

Scale	Range of Score	Score
100%	10	100
90%	9	90
80%	8	80
70%	7	70
60%	6	60
50%	5	50
40%	4	40
30%	3	30
20%	2	20
10%	1	10

Table 5. AISIRE Assessment Criteria in Extracurricular for Male

Range of Score	Category	Score	Value
9	Very Good	5	A
8	Good	4	B
7	Fair	3	C
6	Insufficient	2	D
<6	Poor	1	E

The results of the analysis are relevant to the research objectives, namely to find out the validity and reliability of AISIRE. For female Elementary School students at the upper level, the validity was 0.942 and reliability was 0.781 calculated from 39 students (13 4th grade female students, 13 5th grade female students, 13 6th grade female students) at the 4-meter distance. For female students in Grade 4 Elementary School, the validity was 0.926 and the reliability was 0.743. For female students in 5th Grade, the validity was 0.951 and the reliability was 0.830. For female students in 6th grade, the validity was 0.953 and the reliability was 0.791. The details can be seen in

table 6.

Table 6. AISIRE Validity and Reliability Results for Female Students

	Validity	Reliability
Upper Female Elementary School Students	0,942	0,781
4th Grade	0,926	0,743
5th Grade	0,951	0,830
6th Grade	0,953	0,791

Table 6 describes that the validity and reliability values exceed 0.700 so that AISIRE is considered reliable to be an instrument for measuring reaction speed for female students. For this reason, AISIRE can be used both in PE class and in extracurricular activities related to the reaction speed for upper Elementary School students. The AISIRE assessment criteria in PE class and extracurricular activities are presented in table 7 and table 8.

Table 7. AISIRE Assessment Criteria in PE Class for Female Students

Scale	Range of Score	Score
100%	9	100
90%	8	90
80%	7	80
70%	6	70
60%	5	60
50%	5	50
40%	4	40
30%	3	30
20%	2	20
10%	1	10

Table 8. AISIRE Assessment Criteria in Extracurricular for Female Students

Range of Score	Category	Score	Value
8	Very Good	5	A
7	Good	4	B
6	Fair	3	C
5	Insufficient	2	D
<5	Poor	1	E

This study supports the statement that reaction time is an important element in sports and needs to be tested (Eckner et al. 2014). In addition, AISIRE can be used as an instrument to test and measure the attainment of basic competence related to physical fitness aspects, especially in reaction speed, which is relevant to the structure of the PE curriculum in Indonesia.

This study provides the latest results in Indonesia related to tests and measurements of reaction speed in upper Elementary School students, because the instrument has already had a good level of validity and reliability, which is in line with statements stating that a good instrument must have validity and reliability > 0.700 (Ghozali 2015; 2017). In addition, in compiling the instrument, it should meet the validity and reliability elements (Widoyoko 2014; Nurhasan and Cholil 2014; Ginanjar 2021; 2019).

The use of dice color in AISIRE was related to the statement that visual reaction time is one of the aspects involved when a person doing a fast reaction time, besides the results of the movement (Hülsdünker, Strüder, and Mierau 2018). Therefore, it is important to provide a variety of visuals related to the reaction speed instrument that will be used. It is different from the previous research that did not use a variety of visuals (Fakhi and Berlian 2019; Eckner et al. 2014; Pratiwi and Prayoga 2019; Moradi and Esmaeilzadeh 2015).

This study still has weakness related to the distance used, as it was different between male and female even though this study conducted several AISIRE trials. The results of previous studies are still varied related to the measurements and the results related to the reaction speed. Iran uses 4-meter distance for male and female students, but in AISIRE males use 3-meter distance and females use 4-meter distance. However, the results of a study show that 2-meter distance indicates the direction to move in reaction time (Romeas and Faubert 2015). Thus, it is necessary to conduct further research regarding the distance used, so that male and female students can use the same distance. In addition, further research is expected to develop AISIRE instruments by using technological advances, such as digital circuits, so that AISIRE can be easier, more practical, attractive, and has a selling point to use.

CONCLUSION

This study concludes that AISIRE can be used as an instrument in measuring the reaction speed of upper Elementary School students.

AISIRE meets the validity and reliability according to statistical criteria. For male students, a 3-meter distance is used. Meanwhile, for female students, a 4-meter distance is used. Further research is needed regarding the use of AISIRE at different distances between males and females and using technology relevant to existing technological developments.

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