



ORIGINAL SCIENTIFIC ARTICLE

## DEVELOPMENT OF TENDA IOT174 VOLLEYBALL LEARNING TO IMPROVE COGNITIVE ABILITY, FIGHTING POWER AND SPORTIVITY ON COLLEGE STUDENTS

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### Abstract

**The study purpose** was to improve the cognitive abilities, fighting power and sportivity on the Physical Education Students Study Program at Universitas Nusantara PGRI Kediri.

**Materials and methods.** This study used the Research and Development method. A small-scale field trial was carried out in the sports building of the Universitas Nusantara PGRI Kediri, which implemented volleyball courses. Practical large-scale trials were carried out at STKIP Trenggalek which implemented volleyball courses, Kahuripan University which implemented volleyball courses, and STKIP Pacitan which implemented volleyball courses. The instruments used to collect data were observation, interviews, and assessment of the effectiveness of the test results as regards increasing cognitive abilities, fighting power and sportsmanship; for the validity of the cognitive abilities assessment instrument, validity was 0.865 and reliability was 0.836, for the fighting power assessment instrument, validity was 0.836 and reliability was 0.700, for the sportivity assessment instrument, validity was 0.897 and reliability was 0.824. The data analysis technique used was quantitative descriptive analysis and normality test analysis, and t-test.

**Results.** Based on the obtained results, the pretest and posttest values have a significant difference with the significance value for all variables being  $0.000 < 0.05$ . For the cognitive ability variable, it was  $0.000 < 0.05$ , for the fighting power variable, it was  $0.000 < 0.05$ , and for the sportivity variable, it was  $0.000 < 0.05$ .

**Conclusions.** Based on the results of the study, it was shown that the development of TENDA IOT174 volleyball learning improves cognitive ability, fighting power and sportivity in college students.

**Keywords:** volleyball learning, Tenda IOT174, cognitive ability, fighting power, sportivity.

### Introduction

Human life today is much influenced by the development of technology, and in using this technology is accompanied by a pattern of behavior from the community towards today's technology (Cahyono, 2016). New discoveries related to technology have appeared in various fields or groups of science, including sports science (Ellapen & Paul, 2016). Sport is one of the sciences that can be linked to today's technology and is believed to be able to support progress or facilitate sports activities (Ratten, 2020). It can be said

that technology in sports activities is expected to be able to get information more quickly and the level of truth can be accounted for (Giblin et al., 2016). The development of technology in information and communication systems is closely related to people's lives in the current era of the industrial revolution 4.0 (Ellitan, 2020). This is evidenced by the communication technology and information technology commonly referred to as mobile phones which have made it easier for people to find information (Chhanabhai & Holt, 2010). This technology can be an alternative for people to search for information and this technology has the characteristics of being able to be carried anywhere or more practical, because today's cellphones are supported by the internet network, where there are already various sources of information (Daeng, Mewengkang, & Kalesaran, 2017).

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Mobile phones or communication tools in the current era are device operating systems that can support sophistication, so they are commonly called smart communication tools (Srivastava, 2005). In Indonesia, a communication device that has been widely used by the people of Indonesia has circulated, namely an operating system called Android (Setiawan et al., 2017). From various studies it has been proven that this communication tool gets the first rank or rank in Indonesian society with a percentage of 73.81% in 2015 Startcounter in (Brian Cusack, 2015). Linux-based mobile devices in which there is an operating system and applications are called Android (Cardoso, 2015). In developing and initiating an application that can allow an open platform or commonly referred to as Android (Lee, 2011). There are two types contained in this system, the first is a system that can support Google or Google Mail. The second type is one that does not have full support from Google or OHD (Safaat, 2015).

Based on observations or observations in the field aimed at students who have received volleyball courses at the Nusantara University, PGRI Kediri, Physical Education Study Program which states that almost students show difficulties in understanding the cognitive abilities of basic volleyball techniques or are in the "don't understand" category with a percentage of 85% of level 1, level 3, level 5 and level 7 who have received volleyball learning courses. This is because the basics of each student are different, so that when they are presented with the basic technical material in the volleyball game, the student still has difficulty implementing it in practical activities, because students only practice when learning volleyball takes place, there is no such theory or guide book. which becomes a reference or additional reference about volleyball courses. The results of this observation are very helpful in finding a new approach to volleyball cognitive abilities when students do a practical learning. It also takes fighting power and sportivity.

Students who have cognitive abilities can activate and utilize their knowledge effectively to solve problems (Turner, 2010). Cognitive ability can also be referred to as intelligence and the term intelligence has a broad and complex meaning. The concept of experts on intelligence is different, the difference in this concept mainly lies in the emphasis on certain aspects of mental abilities which are seen as qualities of intelligent behavior. In learning students who have a cognitive level in the low category, will have difficulty learning it and take a longer time to achieve learning outcomes because it is constrained by the ability to grasp the learning material (Awali, 2018).

Fighting power is a person's ability to use his intelligence to direct, change his way of thinking and actions when facing obstacles and difficulties that can make him miserable. In short, fighting power is a person's ability to deal with problems (Nashori & Kurniawan, 2006). Fighting power is not only visible from a physical point of view, but also from a psychological perspective. Therefore, carrying out the task requires perseverance and thoroughness in a long time to measure a child's fighting power from non-physical aspects. Non-physical fighting power will affect physical fighting power (Suparno, 2002). The learning method used, for example by implementing applications in learning, can certainly affect fighting power (Sari & Sylvia, 2014). Meanwhile, sportivity is an attitude of appreciating the noble values in a sport. The beginning of the term sportivity or

can also be called sportsmanship is a term used in the world of sports (Raharja, 2019). In increasing cognitive ability, fighting power and sportivity appropriate efforts are needed. One of them is by following technological developments that are applied in learning.

However, the application of the latest technology in assisting learning is still limited. Therefore, with the technology that wants to be developed, it is hoped that it can help learning, especially in volleyball courses for students to improve cognitive abilities, fighting power, and sportivity in volleyball learning that has been given in accordance with the concept of the semester learning design that has been given. Field observations state that handbooks or modules for students have not been able to make students understand this, so researchers have the idea that in this era of the industrial revolution 4.0, students are more likely to hold cellphones than books related to learning, especially cognitive abilities of basic volleyball techniques, where one of the of these students do not really understand the instructions from the lecturer of the course. From the problems above, the researcher has the idea to develop a learning media related to basic techniques in technology-based volleyball games in the 4.0 industrial revolution era, namely using the Android application. Where later the technology can provide knowledge related to cognitive abilities, fighting power, and sportsmanship of basic volleyball techniques for students so that later with the learning video using the IOT174 tent it can help how to understand cognitive abilities, fighting power, and sportivity in basic techniques with movements correct.

## Materials and Methods

### *Study participants*

This research was The Research and Development which produces a product. Based on explanation (Borg & Gall, 2010) that research and development uses research findings to design new procedures and products, which are then systematically tested in the field, evaluated, and refined until they meet certain criteria of effectiveness, quality, or the same standard. The resulting product can later be used to facilitate the delivery of material in learning basic volleyball techniques through the Tenda IOT174 application. Small-scale trials amounted to 30 samples, large-scale trials amounted to 146 samples, and effectiveness tests totaled 40 samples.

### *Study organization*

This research used the TENDA IOT174 application which was adapted to the characteristics of physical education students taking volleyball courses. TENDA IOT174 is a learning media developed to improve cognitive and affective abilities in volleyball learning which is adjusted to the semester implementation plan at private universities under the PGRI foundation. The development of this learning media is application-based which is in accordance with the volleyball learning material in the PGRI college. This application serves to analyze every movement of students when implementing a basic technical movement in volleyball games, namely upper passing, lower passing, smash, and also serving. Analysis into the application appears that the angle of motion has been adjusted to the basic technical movements

in accordance with the theory in the volleyball game. This application makes it easier for students to find out the extent of the movements that have been implemented by students in the field, so that students will improve every corner of the basic volleyball technique movement if there is something wrong in that corner. The TENDA IOT174 application has features in it related to basic volleyball techniques, when analyzed students can also download the results of the analysis of each of these movements so that students can re-observe the movement at every angle starting from the upper body corner (upper corner) and lower body (bottom corner). This TENDA IOT174 application is android based and requires an internet network to use it.

Assessment of basic volleyball techniques using the TENDA IOT174 application which was carried out for 4 meetings with a duration of 1 meeting for 120 minutes. The assessments taken include 3 assessment domains, namely cognitive, fighting power and sportivity. The data of this study consisted of pretest and posttest data from each assessment. The instruments used to collect data are observation, interviews, assessment of the effectiveness of the test results of increasing cognitive ability, fighting power and sportsmanship, for the validity of the cognitive assessment instrument validity 0.865 and reliability 0.836, fighting power validity 0.836 and reliability 0.700, sportivity validity 0.897 and reliability 0.824.

### Statistical analysis

Statistical analysis using software Statistical Package for Social Science (SPSS) version 21 (SPSS Inc., Chicago, IL, USA). The first analysis is normality test uses the Chi-Square test, while the difference test used the Paired Sample t-Test. All statistical analyzes used a significant level ( $p \leq 0.05$ ).

The study was conducted in accordance with the ethical principles of the Helsinki Declaration for human research and was approved by the Research Ethics Committee of the Universitas Negeri Yogyakarta.

## Results

The first test carried out is a prerequisite test in the form of a normality test as follows:

**Table 1.** Normality Test

|                   | Variabel | Significance | Information |
|-------------------|----------|--------------|-------------|
| Cognitive ability | Pretest  | 0.255        | Normal      |
|                   | Posttest | 0.363        | Normal      |
| Fighting power    | Pretest  | 0.096        | Normal      |
|                   | Posttest | 0.636        | Normal      |
| Sportivity        | Pretest  | 0.979        | Normal      |
|                   | Posttest | 0.139        | Normal      |

Based on the data in the table 1 above, the calculation of the normality test used Chi Square. The significance value on all variables  $> 0.05$ , this indicates that all research variable data has a normal distribution. Furthermore, hypothesis testing will be conducted to determine the difference between the data before and after the study.

### Paired Sample T Test

The Paired Sample T Test results and basic volleyball techniques using the TENDA IOT174 application.

**Table 2.** Paired Sample T Test

| Field of Volleyball Learning | Mean   | t count | Difference | Sig.  | %      |
|------------------------------|--------|---------|------------|-------|--------|
| Cognitive ability            | 82.166 | -7.043  | 9.067      | 0.000 | 11.03% |
|                              | 91.233 |         |            |       |        |
| Fighting power               | 78.166 | -9.840  | 9.434      | 0.000 | 12.06% |
|                              | 87.600 |         |            |       |        |
| Sportivitas                  | 81.333 | -10.751 | 11.067     | 0.000 | 13.60% |
|                              | 92.400 |         |            |       |        |

Based on Table 2 above, the pretest and posttest values have a significant difference with the significance value on all variables  $0.000 < 0.05$ . The increase in the pretest and posttest of the cognitive domain was indicated by the t-value of -7.043 at a significance of 0.000, so it can be concluded that the increase in cognitive scores before and after learning experienced a significant increase. The increase in the pretest and posttest in the realm of fighting power is indicated by a t-value of -9.840 at a significance of 0.000, so it can be concluded that the increase in the value of fighting power before and after learning has a significant increase. The increase in the pretest and posttest in the realm of sportivity is indicated by the t-value of -10.751 at a significance of 0.000, so it can be concluded that the increase in the value of sportivity before and after learning experienced a significant increase. The contribution of basic volleyball techniques using the TENDA IOT174 application for the cognitive ability aspect is 11.03%, the fighting power aspect is 12.06%, and the sportivity aspect is 13.60%.

## Discussion

Based on results that the pretest and posttest values have a significant difference with the significance value on all variables  $0.000 < 0.05$ . Based on these results indicate that the use of the TENDA IOT174 application can increase cognitive ability, fighting power and sportivity on college students. This is probably because the TENDA IOT174 application is very effective to use and its features are very supportive.

In the era of the industrial revolution 4.0, a lecturer is required to be able to develop something with the intention that students can understand and apply the learning without any obstacles in understanding, analyzing and also practicing. The basic technique of android-based volleyball is TENDA IOT174 which combines movement analysis and also the anatomy of motion and angles when performing basic volleyball technical movements, ranging from upper body and lower body movements. So that the basic techniques of volleyball through the TENDA IOT174 application can be used properly as a support or material in learning, especially volleyball for students and can improve cognitive abilities, fighting power and sportivity. TENDA IOT174 application is a development tool. Based on the results obtained, it shows that the development of the TENDA IOT174 application is successful, so that it can

improve Cognitive Ability, Fighting Power and Sportivity on College Students. Development is needed to keep up with the times so that learning can be more optimal.

Development in general means a pattern of growth, gradual change (evolution) and gradual change. Sumarno argues that development means the process of translating or elaborating design specifications into the form of physical features. Development specifically means the process of producing learning materials (Sumarno, 2012). Meanwhile, according to (Sumarno, 2012) development focuses not only on needs analysis, but also on broad issues of early-late analysis, such as contextual analysis. Development aims to produce products based on the findings of field tests. In essence, development is an educational effort both formal and non-formal which is carried out consciously, planned, directed, regularly and responsibly in order to introduce, grow, guide, develop a personality basis that is balanced, intact, aligned, knowledge, skills according to talent, desires and abilities, as a provision on their own initiative to add, improve, develop themselves in the direction of achieving optimal human dignity, quality and abilities as well as independent individuals (Wiryokusumo, 2011).

The TENDA IOT174 application used in volleyball learning can increase students cognitive ability. This is probably because learning volleyball using the TENDA application can be followed and understood by students well, because students who have high cognitive abilities will easily accept the learning material presented (Taub, Floyd, Keith, & McGrew, 2008). Cognitive abilities are thought processes, such as problem solving, comparing, evaluating and creativity. In addition, cognitive aspects include intellectual functions such as understanding, knowledge and thinking skills (Sujiono, 2010). Cognitive abilities related to receiving and reintroducing material are needed because every thought process must use previously learned facts and ideas (Munandar, 2014). Students who have high cognitive abilities in the learning process look faster than the group of students who have low cognitive abilities. This is because factors such as cognitive originating from students, (cognitive strategies) can significantly affect learning abilities and the quality of learning outcomes in physical education. This means that students who have high cognitive abilities tend to be more optimal in the learning process that follows (Paulina, 1997).

The TENDA IOT174 application used in volleyball learning can increase students' fighting power. Previous research shows that there are 11 soccer athletes or 29% have fighting power in the high category, 18 soccer athletes or 47% have fighting power in the medium category and as many as 9 soccer athletes or 24% in the low category. So from these results it can be seen that the highest level of fighting power is in the medium category, the rest in the high and low categories (Susila, 2018). Fighting power affects academic achievement, this is evidenced by students who have high scores, have high fighting power, while students with low scores have low fighting power (Huda & Agus, 2017). Students' efforts in overcoming learning difficulties are called fighting power (Stoltz, 2006). Students who have high fighting power will direct all their potential to achieve achievements or can provide the best results (Fahmi & Rachmahana, 2008). Fighting power is an internal factor of students that needs to be considered (Sari & Sylvia, 2014), because fighting power can give encouragement to students to always achieve learning success and get the best learning achievement.

Fighting power is an intelligence or ability to change, or process a problem or difficulty and make it a challenge that must be solved so as not to hinder the ideals and achievements to be achieved. Strength will also determine student success (Diana, 2008). Someone who has fighting power is able to respond to a situation with a positive response (Pool & Sewell, 2007). In addition, fighting power is able to give one's self-confidence and positive behavior (Arifin, 2020), fighting power can increase student motivation in learning (Aulia et al., 2019; Mayangsari et al., 2021). But, many factors affect fighting power, it is explained that fighting power is influenced by one's self-concept and self-efficacy (Ipriani & Nugroho, 2015).

Volleyball learning by using the TENDA IOT174 application can increase sportivity. This shows that the learning provided through the TENDA IOT174 application can provide a useful experience according to the level of development. This is because sports education is designed to provide an authentic and rewarding sports experience for students. So that the application used can provide real experience to students in participating in sports and can assess not only movement skills but also the attitudes shown during learning activities. A person's attitude is also influenced by his social development. A person's social development will not go well if it is not trained and taught, school is one of the factors that also influences the personality and social behavior of individuals. Therefore, learning needs to be presented in accordance with the needs of the level of development, and covers all aspects of both cognitive, affective, and psychomotor, so that it can shape the character of students to be physically and mentally healthy, and foster a sense of sportivity (Raharja, 2019). Sportivity is ethically appropriate which is made manifest by following the rules of the game, respecting opponents, and committing to fair play, while fair play is identified with certain behaviors characterized by respect for the rules, maintaining equal opportunity and impartiality (Gómez & Sánchez, 2014). Sportivity involves an intense struggle to succeed, a commitment to the spirit of play so that ethical standards will take precedence over strategic advantage when conflict (Weinberg & Gould, 2007).

Based on the explanation above, it shows that in today's learning technology is needed to keep up with the times. In volleyball learning by using the TENDA IOT174 application, it can improve cognitive ability, fighting power and sportivity on college students.

## Conclusion

Based on the results of the study, it was shown that the basic volleyball technique using the TENDA IOT174 application have a significant difference with the significance value on all variables  $0.000 < 0.05$ . On the cognitive ability variable was  $0.000 < 0.05$ , on the fighting power variable was  $0.000 < 0.05$ , and on the sportivity variable was  $0.000 < 0.05$ . The contribution of basic volleyball techniques used the TENDA IOT174 application for the cognitive aspect is 11.03%, the fighting power aspect is 12.06%, and the sportivity aspect was 13.60%.

## Conflict of interest

The researcher declares that there is no conflict of interest in this research.

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# РОЗРОБКА ЗАСТОСУНКУ ДЛЯ НАВЧАННЯ ВОЛЕЙБОЛУ «TENDA IOT174» ДЛЯ ПІДВИЩЕННЯ КОГНІТИВНИХ ЗДІБНОСТЕЙ, ФІЗИЧНОЇ ПІДГОТОВЛЕНOSTІ ТА СПОРТИВНОЇ МАЙСТЕРНОСТІ СТУДЕНТІВ КОЛЕДЖУ

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 2 табл., 38 джерел.

**Метою дослідження було** покращення когнітивних здібностей, фізичної підготовленості та спортивної майстерності в рамках навчальної програми студентів фізичного виховання в Кедірійському університеті Нусантара Асоціації вчителів Індонезії (Східна Ява, Індонезія).

**Матеріали та методи.** У цьому дослідженні використовували метод наукового дослідження та розробки. Маломасштабні польові випробування проводили в спортивній будівлі на території Кедірійського університету Нусантара Асоціації вчителів Індонезії, який упровадив курси з волейболу. Практичні повномасштабні випробування проводили в Тренгалекському педагогічному коледжі (Індонезія), Університеті Кахуріпан (Індонезія), і Пачитанському педагогічному коледжі (Індонезія), які упровадили курси з волейболу. Як інструменти для збору даних використовували спостереження, опитування та оцінювання ефективності результатів тестів щодо підвищення когнітивних здібностей, фізичної підготовленості та спортивної майстерності; стосовно валідності інструмента для оцінки когнітивних здібностей, показник валідності становив 0,865, а надійності – 0,836, стосовно валідності інструмента для оцінки фізичної підготовленості, показник валідності становив 0,836, а надійності – 0,700, стосовно валідності інструмента для оцінки спортивної майстерності, показник валідності становив 0,897, а надійності – 0,824. Як метод аналізу даних використовували кількісний описовий аналіз та аналіз перевірки нормальності розподілу, а також t-критерій Стюдента.

**Результати.** На підставі одержаних результатів встановлено, що значення попереднього та підсумкового тестування статистично значущо різняться, при цьому рівень значущості за всіма змінними приймає значення  $0,000 < 0,05$ . Для змінної когнітивних здібностей він дорівнював  $0,000 < 0,05$ , для змінної фізичної підготовленості він дорівнював  $0,000 < 0,05$ , для змінної спортивної майстерності він дорівнював  $0,000 < 0,05$ .

**Висновки.** На підставі результатів дослідження було підтверджено, що розробка застосунку для навчання волейболу «TENDA IOT174» підвищує показники когнітивних здібностей, фізичної підготовленості та спортивної майстерності студентів коледжу.

**Ключові слова:** навчання волейболу, застосунок «Tenda IOT174», когнітивні здібності, фізична підготовленість.

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