

Development of a web based physical test measurement tool for in depth badminton sports

M. Dimas Praja¹, Hartati^{2*}, Iyakrus³

¹Program Study Master of Sport Education, Sriwijaya University, Palembang, Indonesia

*Corresponding author: hartati@fkip.unsri.ac.id

Abstract

This study aims to determine the practicality of a web-based physical test measuring tool for in-depth badminton sports, determine the level of validity of the developed measuring tool, and determine the level of validity of the use of a web-based physical test measuring tool for in-depth badminton sports. This study uses the Research and Development (R&D) method by producing a product in the form of a web-based physical test measuring tool designed for junior high school students. The research subjects were used as product trials, while the needs analysis involved 15 teachers and coaches in small-scale trials and 30 people in large-scale trials. The data collection technique used a closed questionnaire with a Likert scale to obtain data on the practicality and validity of the developed product. The results of the study showed that the web-based physical test measuring tool for in-depth badminton sports was declared feasible to use based on the results of the validity and practicality tests. The results of measuring the physical condition of students of SMP Negeri 34 Palembang using the application showed a very good category of 10%, a good category of 12%, a sufficient category of 13%, a less category of 39%, and a very less category of 26%. These results indicate that most students are still in the low and very low categories, so a structured and continuous training program is needed to improve leg muscle explosive power, muscle strength and endurance, speed, agility, and cardiorespiratory endurance. Therefore, the developed measurement tool can be used as a practical, valid, and appropriate medium for measuring physical condition to support the badminton sports development process at the junior high school level.

Keywords: Physical test measuring tool, Application, Badminton

Copyright © 2026 Author(s)

Received: 10 08 2026

Revised: 16 09 2026

Accepted: 27 09 2026



Authors' Contribution: A – Conceptualization; B – Methodology; C – Software; D – Validation; E – Formal analysis; F – Investigation; G – Resources; H – Data Curation; I – Writing – Original Draft; J – Writing – Review & Editing; K – Visualization; L – Supervision; M – Project administration; N – Funding acquisition

INTRODUCTION

The advancement of science and technology in the globalization era has brought substantial changes across various aspects of human life, particularly in the fields of education and sports. The emergence of the Industrial Revolution 4.0 has further encouraged the integration of digital technology into various activities and practices, data driven systems, and the integration of information technology into various human activities. This situation demands that the world of education and sports be able to adapt to keep up with the changing times. Fitriani and Aziz (2019) stated that changes to the education curriculum in Indonesia are a response to the continuous advancement of science and technology requires education to adapt to current developments so that the learning process remains relevant to contemporary needs. In the field of sports, the integration of science and technology has an important role in enhancing the effectiveness and quality of training, as well as supporting the achievement of optimal performance. Systematic, tiered, and sustainable sports development must be

strengthened by the support of sports science and technology so that the training process can be more measurable and based on scientific data (Iyakrus et al., 2022). Sports science and technology enable coaches to design more targeted training programs, continuously monitor physical development, and objectively evaluate training results. Consequently, the integration of science and technology into sports training has become an essential requirement in supporting the effectiveness and progress of the training process necessity in modern sports development.

This research is a continuation of the author's The study, entitled "Implementation of Physical Test Results Measurement for Badminton Using an Application for Students at SMP Negeri 4 Palembang City," examined the implementation of a fitness testing application. The findings indicated that the application was able to improve the effectiveness and efficiency of the physical fitness measurement process efficiency and ease of administering physical tests. However, that research did not yet develop an independent measurement instrument and did not fully assess the validity and reliability of the measurement tool. Therefore, this Master's research is directed at developing a web-based physical test measurement tool for in-depth badminton, tailored to the characteristics of junior high school students. Hartati et al. (2022) showed that the use of appropriate approaches in sports learning can improve students' engagement and learning outcomes. This supports the use of technology-based assessment as an effort to make physical testing more systematic and engaging for students.

The physical test measurement tool developed is a badminton physical test instrument, which includes a speed test (30 meter dash), agility test (4x10-meter round-trip run), cardiorespiratory endurance test (multistage fitness test), leg muscle explosive power test (vertical jump), and muscle endurance test (push-ups and sit-ups). All test instruments are integrated into a web-based application that automatically and systematically inputs, processes, stores, and presents student physical test results. Therefore, a research gap exists: the lack of a web-based physical test measurement tool specifically developed for badminton at the junior high school level, accompanied by comprehensive validity and reliability testing. Previous research has been limited to the application implementation stage or the development of measurement tools for other sports with different physical characteristics, thus not fully addressing the need for physical test measurement in badminton in the school environment.

The originality of this research is demonstrated through the development of a web based system designed to facilitate physical fitness assessment test measuring instrument for in-depth badminton sports specifically designed to suit the characteristics of junior high school students.

This research not only utilizes existing applications, but also develops the measurement instrument independently, including the selection of physical test components relevant to badminton, as well as testing. The study also considers the validity and reliability of the developed measuring instrument to ensure that it can provide accurate and consistent results. Therefore, the resulting instrument is expected to offer a more comprehensive, accurate, reliable, and practical approach to supporting the training process and evaluating students' physical condition. Based on these considerations, the researcher intends to conduct a study entitled "Development of a Web-Based Physical Test Measuring Instrument for In-Depth Badminton Sports for Students of SMP Negeri 34 Palembang." This research is expected to contribute to the advancement of sports science, particularly through the integration of technology into physical testing and assessment. The developed instrument is also expected to serve as an appropriate measurement tool that considers the specific physical characteristics and demands of badminton among junior high school students.

METHOD

This research utilized a Research and Development (R&D) approach to develop and evaluate a specific product. This method involves a systematic process of developing a product and examining its feasibility, validity, and reliability before it is implemented. In this study, the product developed was a web-based physical test measuring instrument specifically designed to assess the physical condition of junior high school students in relation to badminton.

The R&D approach was selected because it corresponds with the purpose of this study, which was to develop a measuring instrument that is practical, valid, reliable, and appropriate for assessing students' physical condition. Muthoharoh and Marmoah (2025) stated that research and development is an approach designed to produce a particular product while also evaluating its feasibility prior to implementation.

The research subjects were involved in the product trial process. For the needs analysis, the study involved 30 teachers and trainers in the large-scale trial and 15 teachers and trainers in the small-scale trial. The research was carried out at SMP Negeri 34 Palembang, located on Jl. Pasundan Sekojo, Kalidoni District, Palembang City, South Sumatra. Data were collected using questionnaires in the form of closed-ended statements based on a Likert scale. The data obtained from the development process were analyzed based on three aspects, namely validity, practicality, and effectiveness.

RESULT

This development research focuses on the creation of a digital evaluation instrument as a web based platform specifically developed for assessing, process, and archive data on students' physical abilities at SMP Negeri 34 Palembang in the sport of badminton. The research was conducted at SMP Negeri 34 Palembang located at Jl. Pasundan Sekojo, Kalidoni District, Palembang City, South Sumatra, from April 27, 2026 to May 18, 2026. The development process integrates essential physical components such as agility, reaction speed, and endurance into a computer system that replaces manual measurement methods to minimize human error and increase time efficiency. Through stages of needs analysis, validation by material and media experts, and field trials, this research produces a valid and practical measuring tool that allows teachers and coaches to monitor the development of young athletes objectively, systematically, and can be accessed through digital devices.

The development of a web-based badminton physical test measuring tool can be accessed through the link <https://bokunoai.page.gd/sampleapps/project-bulutangkis> on Mozilla Firefox or Google Chrome which is designed as a practical digital instrument to accurately measure specific physical components of athletes. This application integrates various types of badminton physical tests into a system that is able to automatically process raw data into objective evaluation results based on standard norms that apply to each component of the badminton physical test, namely the vertical jump test, sit up, push up, 30 meter run, shuttle run and MFT listed in the application. By utilizing web-based technology, this measuring tool not only makes it easier for teachers and coaches at SMP Negeri 34 Palembang in the process of collecting data in the field, but also ensures that the management of the student test results database is stored systematically, safely, and can be monitored directly.

Table 1. Data Analysis Results

No	Indicator	Category				
		Excellent	Good	Enough	Less	Very Less
1.	Agility	0%	0%	10%	80%	10%
2.	Speed	20%	40%	10%	15%	15%
3.	Push up power	30%	10%	25%	25%	10%
4.	Sit up power	0%	10%	20%	60%	10%
5.	Muscle explosive power	0%	0%	0%	15%	85%
Average		10%	12%	13%	39%	26%

Table 1 presents the distribution of students' badminton physical test results obtained through the application at SMP Negeri 34 Palembang. The findings indicate that 10% of the students were classified as having a very good physical condition, while 12% fell into the good category. Meanwhile, 13% were categorized as having a sufficient physical condition, 39% were classified as less, and the remaining 26% were in the very less category. These results show that the largest proportion of students was found in the less category, followed by the very less category.

DISCUSSION

1. Digital Transformation in Physical Evaluation

The integration of applications into physical fitness testing represents an innovative advancement in research and development (R&D) within the field of physical education. The use of digital systems eliminates manual data recording, thus minimizing the risk of input errors and increasing the consistency of measurement results. The use of applications in physical fitness testing can support a more comprehensive assessment of students' physical condition. This is relevant to Hartati et al. (2019), who emphasized that nutritional factors are closely related to the physical condition of school-aged children. Hartati, Aryanti, and Victorian (2020) explain that the application of digital technology in physical fitness assessment makes it easier for teachers and coaches to monitor students' physical development more objectively. Hartati et al (2018) emphasized that physical education contributes to producing quality and competitive human beings. Furthermore, Bayu et al. (2023) state that digital based systems can facilitate the management of student performance data in a more structured manner, allowing for faster and more accurate analysis of test results. Therefore, the use of these applications facilitates the mapping of individual student biomotor abilities as a basis for developing training programs.

2. Performance Analysis Based on Test Sequence

Speed is considered a fundamental biomotor ability that contributes to performance in various sports. According to Henjilito (2020), speed refers to an individual's capacity to execute a movement within the shortest possible time, which is closely related to the functioning of the nervous and muscular systems. This ability involves performing repeated movements rapidly or covering a given distance in the shortest time possible (Budiman & Prabowo, 2020). In line with Hidayat's (2020) opinion, speed is the ability to move or cover a distance quickly. In badminton, this ability plays a crucial role in changing a player's position on the court. Results that are still in the low category indicate that students' acceleration abilities have not developed optimally and still require more targeted training.

Agility refers to the ability of an individual to rapidly change body position or direction while maintaining balance and control. Hidayat and Wulandari (2020) describe agility as a physical ability that is supported by the interaction of speed, motor coordination, and reaction ability. Similarly, Sumerta et al. (2021) define agility as the capacity to move and change direction rapidly in various directions, including forward, backward, sideways, and diagonal movements. Santika (2020) further emphasizes that agility involves the ability to change position efficiently, quickly, and accurately according to the direction of movement. Results in the moderate to poor category indicate that students' footwork coordination is not yet effective, resulting in inefficient movement on the field.

Leg muscle explosive power refers to the ability of the leg muscles to produce maximum force within a very short period. Azizah and Widodo (2021) state that power is an important factor in determining the effectiveness of explosive movements, including jumping and attacking actions. Oktariana and Hardiyono (2020) explain that arm muscle explosive power is the capacity to generate maximum force through a single movement. In comparison, leg muscle explosive power refers to the ability of the muscles or muscle groups in the lower limbs to produce the greatest possible force rapidly, enabling athletes to perform explosive actions effectively force in a very short period of time, as explained by Prakoso & Sugiyanto (2017). Low results in this component indicate that students' leg muscle explosiveness still needs to be improved through more specific training.

Core muscle strength plays a crucial role in maintaining body stability during sports movements. Hartati, Syamsuramel, and Victorian (2022) explain that core stability functions as a center for energy transfer between the lower and upper body. According to Setiawan (2021) core muscle strength is an essential component of an athlete's physical fitness, as it plays an important role in maintaining body stability and balance during physical activities, stability, and movement control during sports activities. Furthermore, core strength also contributes to improved athlete performance, particularly in sports that require precise positional shifts, speed, and coordination. Similarly, research by Azmi et al. (2023) shows that strong core muscles can improve movement efficiency and reduce the risk of injury, as the body has better postural control during high-intensity physical activities, such as swimming and sports games. The low results indicate that students' core stability is not optimal, which can impact the effectiveness of movements during play.

Arm muscle strength influences the ability to generate power with each shot. Pratama and Irawan (2021) state that upper extremity strength plays a significant role in increasing

stability and movement effectiveness in sports. According to Hermanzoni (2020) arm muscle strength refers to the capacity of the muscles to withstand or overcome resistance during physical activities. In contrast, leg muscle explosive power describes the ability of the leg muscles to produce maximum force within a short period. Sukadiyanto (2020) emphasizes that arm muscle strength is an important component of physical fitness that supports various upper-body motor skills, particularly in sports involving movements such as throwing, hitting, and pushing. This strength is also related to the body's ability to maintain stability and produce optimal motor performance. The low results in this component indicate that students' arm muscle strength still needs to be improved through regular strengthening exercises.

Cardiopulmonary endurance, or $VO_2\text{Max}$, is the body's ability for sustain physical activity to a relatively long period of time. Agustin, Hartati, and Aryanti (2021) explain that a good $VO_2\text{max}$ level significantly influences an athlete's ability to maintain performance during a match. According to Putra & Priyono (2026), $VO_2\text{max}$ is a key indicator of cardiorespiratory fitness, influencing endurance in play and the ability to maintain physical performance throughout a match. Meanwhile, $VO_2\text{max}$ can also be understood as the mechanism by which the heart, lungs, and body cells work together optimally to absorb oxygen and distribute it throughout the body's tissues to support metabolic processes (Aliriad et al., 2024). Students' low endurance levels lead to decreased movement quality and concentration during prolonged matches.

The findings are consistent with Hartati et al. (2020), who developed a vibration sensor-based ball capture test to facilitate more objective and efficient measurement. Similarly, the present study applies technology to simplify the measurement and evaluation of students' physical condition in badminton. Researchers developed a special application to digitize athlete physical tests to replace manual procedures that have been deemed inadequate. This software is designed as a practical measuring tool for coaches in the field, with the advantage of open accessibility to the public, thus supporting the standardization of sports performance measurements more efficiently.

CONCLUSIONS

The findings obtained from the physical condition assessment of the Badminton sport of SMP Negeri 34 Palembang using the application, which includes vertical jump tests, sit ups, push ups, 30 meter run, shuttle run, and Multistage Fitness Test (MFT), It can therefore be concluded that the athletes' physical condition level is still dominated by the poor and very

poor categories. The percentage of the poor category of 39% and very poor at 26% indicates that most participants do not have optimal physical condition to support performance in badminton. Meanwhile, participants who are in the very good category are only 10% and the good category is 12%, while the sufficient category is 13%. The findings demonstrate that physical capacities, particularly leg muscle explosive power, muscular strength, and endurance, speed, agility, and cardiorespiratory endurance still need to be improved through a structured and continuous training program. Thus, in general, the physical condition of badminton athletes of SMP Negeri 34 Palembang still needs further attention and coaching in order to achieve a better level of fitness and support sports achievements.

ACKNOWLEDGMENTS

The author would like to express his gratitude to:

1. The Head of the Master of Sports Education Study Program at Sriwijaya University for their support and guidance during the preparation of this journal article.
2. All lecturers of the Master of Sports Education Study Program at Sriwijaya University are gratefully acknowledged for the valuable knowledge, guidance, and constructive feedback provided throughout the research process and preparation of this article.
3. The researcher also expresses sincere appreciation to all administrative staff of the Master of Sports Education Study Program at Sriwijaya University for their support, assistance, and services during the completion of this study.
4. The Principal of SMP Negeri 34 Palembang, along with teachers, coaches, and all school officials who provided permission, support, and assistance in conducting this research.
5. His beloved family for their prayers, gratitude, motivation, and unwavering support throughout the research and preparation of this article.
6. His friends for their constant encouragement, support, and assistance during the preparation of this journal article.
7. His colleagues in the Master of Sports Education Study Program at Sriwijaya University for their togetherness, cooperation, and mutual motivation throughout their studies.
8. All individuals and parties who have contributed, either directly or indirectly, to the successful completion of this research and the preparation of this journal article.

REFERENCES

- Agustin, W. W., Hartati, H., & Aryanti, S. (2021). Physical Fitness Analysis of Student Learning Outcomes. *Journal Physical Education, Health and Recreation*.

- Aliriad, H., Hudah, M., Apriyanto, R., & Da'i, M. (2024). Pengaruh Circuit Training dan Kadar Oksigen dalam Minuman Terhadap Nilai VO2MAX. *Jendela Olahraga*, 9(1), 159-167.
- Azizah, N., & Widodo, A. (2021). Evaluasi Kondisi Fisik Atlet. *Jurnal Kesehatan Olahraga*.
- Azmi, A. U., Winaya, I. M. N., & lainnya. (2023). Kekuatan otot core memengaruhi performa renang gaya bebas. *Jurnal Ilmu Fisioterapi Indonesia*.
- Bayu, W. I., dkk. (2023). Needs Analysis of Digital-Based Physical Fitness Test Application. *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani*.
- Bayu, W. I., Yusfi, H., Syafaruddin, S., Iyakrus, I., & Usra, M. (2023). Pendampingan pengukuran kebugaran jasmani berbasis penilaian mandiri melalui aplikasi Sriwijaya Bugar. *PROMOTIF: Jurnal Pengabdian Kepada Masyarakat*, 3(2), 108-114.
- Budiman, A., & Prabowo, G. D. (2020). Latihan power otot lengan untuk kecepatan push dalam olahraga hockey. *Journal of Physical and Outdoor Education*, 2(2), 163-171.
- Fitriani, Y., & Aziz, I. A. (2019, March). Literasi era revolusi industri 4.0. In *Prosiding Seminar Nasional Bahasa dan Sastra Indonesia (SENASBASA)* (Vol. 3, No. 1).
- Hartati, Aryanti, S., & Syafaruddin. (2020). Pelatihan Pengembangan Bahan Ajar Penjaskes Berorientasi pada Media Pembelajaran Interaktif. *Bravo's Jurnal Program Studi Pendidikan Jasmani Dan Kesehatan*, 8(01), 18.
- Hartati, H., Destriana, D., & Junior, M. (2019). Latihan Dot Drill One Foot Terhadap Kelincahan Tendangan Sabit Dalam Ekstrakurikuler Pencak Silat. *Altius: Jurnal Ilmu Olahraga Dan Kesehatan*, 8(1).
- Hartati, H., Destriana, D., Silvi Aryanti, S. A., & Destriani, D. (2018). Macro Flash-based Multimedia for Improvement of The Learning Result of Volleyball Game. In *Advances in Social Science, Education and Humanities Research*, 4th International Conference on Teacher Training and Education (ICTTE 2018) (Vol. 262). Atlantis Press SARL.
- Hartati, H., Victorian, A. R., Aryanti, S., Destriana, D., & Destriani, D. (2018). Application of model development of soccer physical tests. In *IOP Conference Series: Materials Science and Engineering* (Vol. 434, No. 1, p. 012158). IOP Publishing.
- Hartati, H., Aryanti, S., & Victorian, A. R. (2020). Development of Physical Test Application Based on Digital Technology. *International Journal of Human Movement and Sports Sciences*.
- Hartati, H., Syamsuramel, S., & Victorian, A. R. (2022). Pengembangan Media Evaluasi Tes Fisik Berbasis Digital. *Jurnal Pendidikan Jasmani*.
- Hartati, H., Aryanti, S., & Destriana, D. (2019). Factors that influence the nutritional status of elementary school children. *Journal of Physics: Conference Series*, 1166, 012010. <https://doi.org/10.1088/1742-6596/1166/1/012010>
- Hartati, H., Destriana, D., & Aryanti, S. (2020). Development of ball capture test based on vibration sensor. *Journal of Physics: Conference Series*, 1480, 012076. <https://doi.org/10.1088/1742-6596/1480/1/012076>
- Hartati, H., Ursa, M., Hardiyono, B., & Jaya, R. W. (2022). Improving creativity and learning motivation in basketball through a tactical approach. *Cakrawala Pendidikan*, 41(2), 521–530.

- Henjilito, R. (2020). Analisis Kecepatan dalam Aktivitas Lari Sprint. *Journal Sport Area*.
- Hermanzoni, H. (2020). Pengaruh kekuatan otot lengan dan daya ledak otot tungkai terhadap kemampuan smash bolavoli. *Jurnal Patriot*, 2(2), 654-668.
- Hidayat, R. (2020). Pengaruh Metode Latihan Plyometrics terhadap Kecepatan Atlet Sepakbola SMA N 4 Sumbar FA. *Jurnal Performa Olahraga*, 5(1), 48-53.
- Hidayat, R., & Wulandari, F. Y. (2020). Hubungan Kelincahan dengan Kemampuan Motorik. *Jurnal Performa Olahraga*.
- Iyakrus, I., Ramadhan, A., Bayu, W. I., & Sari, N. M. (2023). Efektivitas Penggunaan Pitcher Machine Dalam Meningkatkan Keterampilan Smash BuluTangkis. *Jambura Health and Sport Journal*, 5(1), 1-6.
- Iyakrus, Sumarni, S., & Bayu, W. I. (2022). Evaluasi Program Pembinaan BuluTangkis diKabupaten Banyuasin. *Jurnal Pendidikan Kesehatan Rekreasi*, 8(2), 247–256.<https://doi.org/10.5281/ZENODO.6684692>
- Muthoharoh, N. Z., & Marmoah, S. (2025). Studi Literatur: Analisis Model Borg and Gall dalam Pengembangan dan Penelitian Pendidikan. *AT-TAKLIM: Jurnal Pendidikan Multidisiplin*, 2(12), 226-237.
- Oktariana, D., & Hardiyono, B. (2020). Pengaruh daya ledak otot lengan, daya ledak otot tungkai dan kekuatan otot perut terhadap hasil smash bola voli pada siswa SMK Negeri 3 Palembang. *Journal Coaching Education Sports*, 1(1), 13-26.
- Prakoso, G. P. W., & Sugiyanto, F. (2017). Pengaruh Metode Latihan dan DayaTahan Otot Tungkai terhadap Hasil Peningkatan Kapasitas Vo 2 max Pemain Bola Basket. *Jurnal Keolahragaan*, 5(2), 151-160.[https://doi.org/https://doi.org/10.21831/jk.v5i2.10177](https://doi.org/10.21831/jk.v5i2.10177)
- Pratama, R., & Irawan, A. (2021). Pengaruh Latihan Kekuatan Otot Lengan. *Jurnal Ilmu Keolahragaan*.
- Putra, F. K., & Priyono, B. (2026). Analisis Peran Daya Tahan Kardiorespirasi (VO₂Max) terhadap Performa Atlet Sepakbola: Tinjauan Pustaka Sistematis. *SPRINTER: Jurnal Ilmu Olahraga*, 7(1), 391-399.
- Santika, I. G. P. N. A., & Subekti, M. (2020). Hubungan Tinggi Badan Dan Berat Badan Terhadap Kelincahan Tubuh Atlit Kabaddi. *Jurnal Pendidikan Kesehatan Rekreasi*, 6(1), 18-24.<https://doi.org/10.5281/zenodo.3661565>
- Setiawan, I. (2021). Analisis Kekuatan Daya Tahan Otot Inti, Indeks Massa Tubuh dan VO₂Max Atlet. *Jurnal Pendidikan Kesehatan Rekreasi*.
- Sukadiyanto. (2020). *Teori dan Metodologi Melatih Fisik*. Yogyakarta: UNY Press.
- Sumerta, I. K., Santika, I. G. P. N. A., Dei, A., Prananta, I. G. N. A. C., Artawan, I. K. S., & Sudiarta, I. G. N. (2021). Pengaruh pelatihan circuit training terhadap kelincahan atlet sepakbola. *Jurnal Pendidikan Kesehatan Rekreasi*, 7(1), 230-238.