Original Article

e-ISSN: 2721-7175 p-ISSN: 2089-2341

Reconstruction of the digital number-based straight kick strength detection tool in pencak silat

Selvani Apriliana Putri[1ABCDE], Dhani Agusni[2BCDE], Sriningsih[3CDE]

[1,2,3] Pendidikan Jasmani, Kesehatan dan Rekreasi, Sekolah Tinggi Keguruan dan Ilmu Pendidikan Pasundan, Indonesia

Authors' Contribution: A – Study Design, B – Data Collection, C – Statistical Analysis, D – Manuscript Preparation, E – Funds Collection

Abstract: Existing tools have not been able to detect the magnitude of the kick in pencak silat. This study aims to find out how the process of reconstruction of the digital number-based straight kick power detection tool in pencak silat. This type of research uses the ADDIE (*analysis, design, development, implementation, evaluation)* development method. The analysis stage identifies the needs and characteristics of users, Design makes 3D prototype designs, Development makes and tests products, Implementation of product trials to SME athletes, This evaluation is carried out on each product development. The data analysis technique uses a presentation test whose purpose is to present data that has been obtained from *experts* and athletes. The subjects of this study are 3 experts and 10 athletes of STKIP PASUNDAN pencak silat UKM, the instrument used for the validation of the tool is in the form of questionnaires or questionnaires. The results of this study were obtained that the straight kick strength detection tool was declared feasible with a penalty score of 78% and the tool could detect the straight kick force with 80% success. So it can be concluded that this digital number-based straight kick strength detection tool is suitable for use in the training process and can detect the force of straight kicks. Therefore, this tool can be recommended as a safe, effective training tool and a reference for coaches and athletes to evaluate the strength of the kick objectively.

Keywords: Pencak Silat, Kick Power, Detection Tool, Digital Learning.

Corresponding author: Selvani Apriliana Putri, email: selvaniapriliana@gmail.com

Recevied: 2025-10-07; Accepted: 2025-12-08 Published online: 2025-12-30

Reconstruction of The Digital Number-Based Straight Kick Strength Detection Tool in Pencak Silat.
Jurnal maenpo: jurnal Pendidikan Jasmani Kesehatan dan Rekreasi
Vol 15 No 2(2025); Volume 15 Nomor 2 Tahun 2025

INTRODUCTION

Pencak silat is learned through a basic technique approach Basic techniques that are important in pencak silat, such as stances, pairs, and attacks in the form of punches and kicks (Herdiman et al., 2022). The basic technique of kicking is one of the methods that can produce scores or important points (Rahayu et al., 2024). In this kick exercise, it is necessary to have supporting factors such as several dominant physical components such as strength, flexibility and balance. Strength is the ability of a muscle to perform one contraction at its maximum against resistance or load (Hajir, 2019). Strength is very necessary in kicks to produce maximum kicks that make it difficult for opponents. In pencak silat straight kicks give an influence to get points and win the match, for that every athlete must train strength in doing straight kicks (Ismail et al., 2024). The development of physical condition is based on the need for techniques and tactics in attacking and being attacked (Vai & Ramadi, 2018). Researchers observed that during kick training, athletes often use unstable strength. One of the supporting factors to improve technical skills is by using tools (Suprayitno, 2022). Media or tools can be used in the delivery process from teacher to student, either in physical or software form so as to make learning more interesting (Ahmed Thohir Alfarizi, Silvy Juditya, 2024), similarly in the training process, media can be used as an auxiliary tool. The aids used in the pencak silat training process are sacks and pecing. A sack is an aid in martial arts that acts as a medium for attacking targets to train kicks and punches (Rarasti & Heri, 2019). The sack is generally cylindrical or like a suspended bolster and usually contains sand, fragments of green beans, black beans, plastic ore, patchwork, and others (ANA et al., 2023). Pecing pads are tools for training with static or stationary target positions (Pratama & Hamdani, 2024).

The tools that are often used do not have a touch of technology, where the tools are only a target or target to make a kick without knowing the strength of the kick. So researchers want to make tools that will be developed based on technology in accordance with existing demands. The sport of pencak silat must be able to adapt to the times and technological advancements. The use of technology greatly affects performance to achieve goals (Triansyah et al., 2023) With the existence of science and technology (IPTEK), it can be a source of knowledge that goes hand in hand with technology and makes breakthroughs to help the pencak silat training process. So that they follow developments and learn well and correctly about science and technology with

the aim of utilizing science and technology as an improvement and development of athletes' achievements as a whole (Roy Try Putra, 2020).

Research related to the development of kicking force detection aids has been carried out, including research by (Lunnisa et al., 2022), with the research title " Perancangan Alat Pengukur Kecepatan dan Kekuatan Tendangan Serta Pukulan pada Beladiri dengan Sensor Force Sensing Resistor (FSR) Dan Nodemcu ESP32". Research according to (Yasi & Nurcholis, 2019), with the research title " Analisis Kekuatan Pukulan Atlet Beladiri Menggunakan Metode Pengukuran Matematis dan Alat Ukur Berbasis Mikrokontroller ". Research by (Rarasti & Heri, 2019). With the title "PENGEMBANGAN ALAT BANTU LATIHAN SAMSAK BERBASIS TRAFFIC LIGHT TERHADAP KECEPATAN REAKSI TENDANGAN PADA ATLET TAEKWONDO". Research by (ALFIN ADAM et al., 2022) With the title" Pembuatan Alat Bantu Latihan Reaksi Pada Pencak Silat Kategori Tanding Manufacture". Research by (Syamsiah et al., 2020) With the title "PENGEMBANGAN ALAT LATIHAN TANGKAPAN PENCAK SILAT". Based on research that has been conducted related to the development of tools, it focuses more on the development of sensor-based training aids but is not yet specific on sensor-based training aids to detect kick force in the sport of pencak silat.

Based on the above explanation , the purpose of this study is to develop a digital number-based straight kick power detection tool in pencak silat. The researcher feels that research related to this development tool needs to be carried out in the hope of producing a product in the form of a digital number-based straight kick strength detection tool in pencak silat in addition to that it is hoped that this detection tool can help coaches in training evaluation and become a reference for athletes' motivation in training.

MATERIAL AND METHODS

The research method used is the development of ADDIE (*Analysis, Design, Development, Implementation, Evaluation*). The ADDIE instructional model is an instructional process consisting of five phases, namely dynamic analysis, design, development, implementation and evaluation (Cahyadi, 2019). According to (Mesra, 2023) The ADDIE model uses inputs, process and output analysis are the inputs for system design, development and evaluation are the processes and implementation is the output. The following is a design overview of the ADDIE model development method research.

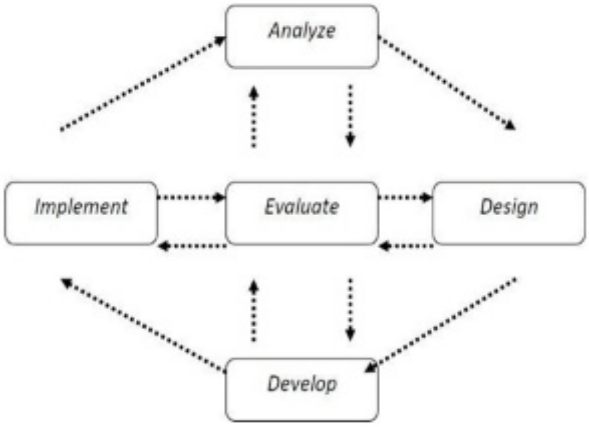

Figure 1. ADDIE Model Development Methods

Source (Safitri & Aziz, 2022)

In the analysis stage, conduct needs analysis and user characteristics analysis through interviews and observations. The design stage includes a 3D design description of the prototype tool and animation as an illustration of the use of the tool later. At the development stage, it is divided into two, namely the development of tools according to the design that has been approved by experts and the feasibility test of the tool by experts, after the tool is declared feasible, it enters the implementation stage for product trials for STKIP PASUNDAN pencak silat UKM athletes. This evaluation stage is carried out in each product development followed by revisions to improve the tools to make it easier for each stage to be passed.

The data sources in this study are 3 experts and 10 athletes of STKIP PASUNDAN pencak silat UKM. Where the experts consist of media experts, material experts and licensed trainers, namely: Dr. Dr. Rony Muhammad Rizal, S.T., S.Pd., M.Si. as media experts, Dr. Nancy Trisari Schiff, M.Pd. as pencak silat material experts, and Istiar Fidia Irianti, M.Pd. as internationally licensed trainers from IPSF. The instruments in this study used a tool feasibility test questionnaire and a straight kick strength test. Questionnaires are an efficient data collection technique if the researcher knows exactly which variables will be measured and knows what can be expected from the respondents (Scott, 2020). This questionnaire is used to get the eligible categories in the tool created. The questionnaire uses the Likert scale. The data analysis technique carried out was a presentation test. Where the researcher presents the data that has been obtained from *Expert* and athletes. By calculating the percentage for the data that has been received.

RESULTS

1. Analysis

At this stage, the researcher conducts interviews and observations to analyze information from existing problems. As a result, it is known that SMEs do not yet have technology-based tools, so they need tools to detect kick force, because existing tools cannot detect athletes' kick strength. Coaches also need to monitor and evaluate the development of athletes' kicking techniques as well as the strength of their physical components including kick power. And for athletes, they need tools that can be their reference and motivation in the training process.These findings form the basis for designing appropriate training aids.

2. Design

At this stage, the researchers made two prototype designs. First, make an initial prototype to be submitted to experts for input. Second, refine the prototype based on these suggestions. One of the important improvements Where the iron frame of the pecing support is not used because it can be at risk of causing injury and storage *Blackbox* not separated from the peking, but *Blackbox* stored on pecing. The results of the evaluation show that the tool is more flexible.

3. Development

At this stage, the construction of a digital number-based straight kick strength detection tool is carried out in accordance with the expert's decision, the following are the results of making a digital number-based straight kick strength detector in pencak silat:

Figure 2. Digital numerical based straight kick force detection tool.

Figure 2 is the result of a tool that has been agreed upon by experts, where the blackbox is separated by pecing to minimize the occurrence of errors due to shocks during use.

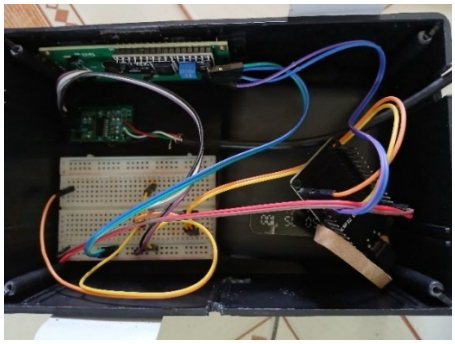

Figure 3. Electronics Network

Figure 3 is a series of electronics in a *blackbox* where everything has been assembled into a single unit. The electronics series consists of the Esp32 which functions as a microcontroller where this device will process the data generated by the loadcell sensor, the hx711 module is a amplifier module that functions to convert pressure changes into units of weight, a powerbank that functions as an electric current, and an LCD screen that displays digital numbers of the received results.

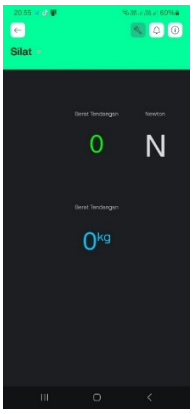

Figure 4. Blynk IoT Display

Figure 4 shows the Blynk IoT display, where the researcher uses the Blynk IoT application to allow users to control and also monitor the device remotely through a mobile phone by connecting the hostpot with the Esp32. Where when the tool is activated, the results obtained can be read by the LCD screen in the form of digital numbers and also the user's or trainer's phone.

At this stage, after the prototype development, it is continued with *expert validation* so that it can proceed to the next stage. *The experts* involved were 3 people, namely media experts,

material experts and coaches in addition to the validation of athlete validation experts were also included to assess the feasibility of the tools that had been made. Each *expert* and athlete is given a questionnaire to be filled out and the results of the questionnaire determine the feasibility of the tool that has been made. The following are the results of the tool validation presented in the table below:

Table 1. Media Expert Validation Results

Respondents	Aspects	Score	Information
Media Member	Material Aspects of Materials	100%	Highly Worth It
	User Aspect	100%	Highly Worth It
Average Score		**100%**	**Highly Worth It**

The results of the validation of media experts include two aspects, namely the material aspect of the material and the user aspect with the result of a material aspect score of 100% which means "Very Feasible" and a score of 100% which means "Very Feasible". So that the average score of the media expert validation produces a score of 100%, which means that the tool made has the category of "Very Feasible" in terms of the media that has been used for the development of the prototype.

Table 2. Material Expert Validation Results

Respondents	Score	Information
Material Expert	67%	Proper

The results of the validation of the material expert showed a score of 67% which means that the tool made has the category "Feasible", where this tool in terms of material is in accordance with what has been planned by the researcher so that a tool for detecting the force of a straight kick has been made.

Table 3. Trainer Validation Results

Respondents	Score	Information
Coach	66%	Proper

The results of the trainer's validation show a score of 66% which means that the tool made has a "Feasible" category to be used in the training process and its use can help the trainer.

Table 4. Athlete Validation Results

Respondents	Score	Information
Athlete	81%	Highly Worth It

The results of the athlete's validation showed a score of 81% which means that the tool made has the category "Very Feasible". so it can be concluded that the tool is "Very Feasible" and can be used to detect the force of a straight kick.

Table 5. Validation Results of Experts and Athletes

Respondents	Score	Information
Media Member	100%	Very Worthy
Material Expert	67%	Proper
Coach	66%	Proper
Athlete	81%	Highly Worth It
Average Score	**78%**	**Proper**

The overall results of the expert evaluation *showed* an average score of 78% which means that the tool made has the category "Feasible". So that the results of *expert validation* show that the tool made is "Feasible" and can proceed to the implementation stage.

Implementation

Followed by the trial stage for STKIP PASUNDAN pencak silat UKM athletes. Where 10 athletes conducted 3 experiments with the tools according to the coach's recommendations to see if the tools made could detect strength or not. Data capture using scale *Guttman.* The results of the tool trial were calculated using a percentage where the success percentage got a score of 80%. So that the tool made can detect the strength of the straight kick.

Evaluation

Evaluation includes an analysis of the implementation process, participant response, and results achieved to ensure that goals are optimally achieved. As in the stages *Design* There was an input about the iron frame that did not need to be used, so the researcher changed the*esign* that is already in the manufacturing process. Then after the tool in the *Development*

Feedback occurs so that *Blackbox* separated and the researcher has fixed it before the implementation stage is carried out. After all the revisions are completed and the tool is deemed feasible, then the implementation stage is carried out to see if the tool successfully detects the force of the straight kick.

DISCUSSION

This research aims to develop a digital numerical straight kick strength detection tool. The results of the study showed that the tool could detect the force of the straight kick well, marked by the validation results *Expert* and athletes show the category of feasible to very feasible. The success of the tools developed is inseparable from the theory of motion and the digitization of technology-based training aids using sensors.

This pencak silat is an oMartial arts is full body contact and can be categorized as heavy sports where the body needs enough energy to produce excellent physical condition to support techniques and tactics (Widiastuti et al., 2020). Motor skills are also considered to facilitate the implementation of movement skills (Arisman & Agun Guntara, 2021). In motion theory, force is one of the physical components. Strength is a very important component for pencak silat athletes because it can improve the most dominant muscles (Setyawan & Setiawan, 2022). (Husen & Rahmat, 2022) stated that the strength of the leg muscles has a significant relationship with the straight kick ability of pencak silat athletes. Where straight kicks are very important in pencak silat, so the exercises carried out must be repeated (Suryadin et al., 2021). Therefore, a training tool that can measure the strength of a straight kick is very necessary in the training process so that coaches can monitor the improvement in the physical condition of athletes.

Today's digital era, the use of digital media in sports has undergone many developments over the years (Juditya et al., 2025). Along with technological advancements, many sports today have taken advantage of digitalization, including in training aids. This digitalization is a process of changing from a manual system to a digital system. The development of science and technology and sports science is one of the facilities that must be used for athletes' achievements (Roy Try Putra, 2020). In this study, the existence of a loadcell as a sensor that converts the physical pressure of the kick into a digital number displayed on the LCD screen and Blynk IoT, is an application of media digitization. The results of this study are in line with

previous research conducted by (Lunnisa et al., 2022) in the development of a measuring device for the strength and speed of kicks in taekwondo, where FSR and ESP32 sensors are able to read the strength of an athlete's kick and present it in digital units accurately. This study adapts a similar but specific concept for straight kicks in pencak silat and the sensors used are different. This research also proves that the combination of digital sensor technology and Blynk IoT applications can help coaches and athletes in evaluation. This is also in line with the opinion that digital-based training aids can increase the motivation and training efficiency of martial artists with real-time data displays (Rarasti & Heri, 2019).

The tool is still a prototype with some weaknesses, where the use of hard tools and heavy sensor data and too high loadcell sensitivity cause the performance of the esp32 to be *Delay*. Sometimes the data produced can appear immediately and it can be *Delay* because of its use. So for readers this can be a recommendation if you want to continue this research. The trial of the tool was only carried out on 10 athletes, this could affect the generalization of the research results, as the tool has not been tested in a wider environment or at the level of professional competition. Overall, the reconstruction of this strength detection device has been successfully made and can be a solution to the need for training aids that were previously still conventional. With the results of validation and trials, this tool was declared feasible and could detect the power of a straight kick in pencak silat.

CONCLUSION

The reconstruction process of the digital numerical straight kick force detection tool in pencak silat was carried out with the development of ADDIE (*Analysis, Design, Development, Implementation, Evaluation)* which includes the manufacture of tools with smartphone-based control, electrotronics design and tool testing. Based on the results of the calculation that has been described in chapter 4, the researcher proposed a conclusion in the form of a tool for detecting the strength of a straight kick based on digital numbers in pencak silat was declared feasible based on the results of validation from the 3 experts and athletes with an average score (78%,) in addition to that based on the results of the calculation from the trial produced (80%) a detection success rate, so that the tool was declared to be able to detect the strength of the straight kick.

Acknowledgments: The researcher submits to all parties who helped

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCES

Ahmed Thohir Alfarizi, Silvy Juditya, D. B. (2024). *Analisis Penggunaan Media Pembelajaran Dalam Implementasi Penjas Adaptif*. *3*, 26–27.

ALFIN ADAM, Wardoyo, H., & Apriyanto, T. (2022). Pembuatan Alat Bantu Latihan Reaksi Pada Pencak Silat Kategori Tanding. *Jurnal Ilmiah Sport Coaching and Education*, *6*(1), 44–50. https://doi.org/10.21009/jsce.06107

ANA, M. G., Swidinata, S., Winata, F., Firmansyah, N., M. Suhadi, M. S., & Junaidi, I. A. (2023). Perbedaan Latihan Menggunakan Samsak dan Petching Terhadap Keterampilan Tendangan Pencak Silat Atlit Putra Perguruan Satria Muda Indonesia Komda Sumatera Selatan. *Musamus Journal of Physical Education and Sport (MJPES)*, *5*(02), 231–241. https://doi.org/10.35724/mjpes.v5i02.5347

Arisman, A., & Agun Guntara, R. (2021). The Research Of Students' Motor Ability In Archery Extracurricular. *Jurnal Maenpo : Jurnal Pendidikan Jasmani Kesehatan Dan Rekreasi*, *11*(1), 13. https://doi.org/10.35194/jm.v11i1.1216

Cahyadi, R. A. H. (2019). Pengembangan Bahan Ajar Berbasis Addie Model. *Halaqa: Islamic Education Journal*, *3*(1), 35–42. https://doi.org/10.21070/halaqa.v3i1.2124

Hajir, A. (2019). Pengaruh Kelentukan, Kekuatan dan Keseimbangan Terhadap Kemampuan tendangan Lurus Kedepan Atlet Pencak Silat Kota Palopo. *Jurnal Health and Sport*, *1*(5), 1–13.

Herdiman, D. C., Lubis, J., & Yusmawati, Y. (2022). Model Latihan Kelincahan Tendangan Sabit Pencak Silat Menggunakan Alat Bantu Ladder Drill. *Jurnal Speed (Sport, Physical Education, Empowerment)*, *5*(2), 121–126. https://doi.org/10.35706/jurnalspeed.v5i2.7066

Husen, J., & Rahmat, Z. (2022). Hubungan Kekuatan Otot Tungkai Dengan Kemampuan Tendangan Lurus Pada Atlet Silat Binaan Koni Aceh Tahun 2021. *Jurnal Ilmiah Mahasiswa Pendidikan*, *3*(2). https://jim.bbg.ac.id/pendidikan/article/view/696%0Ahttps://jim.bbg.ac.id/pendidikan/article/view/696/409

Ismail, A., Djuma, P., Haryanto, A. I., & Hidayat, S. (2024). Pengaruh Media Latihan Samsak dan Pecing Pad Terhadap Peningkatan Kecepatan Tendangan Pencak Silat. *Mahasiswa Pendidikan Olahraga*, *4*(3), 550–556.

Juditya, S., Pratiwi, F., & Zakaria, D. A. (2025). *The role of digital tools in developing physical education teachers ' digital competence : a case study of a platform El papel de las herramientas digitales en el desarrollo de la competencia digital de los profesores de educación física : un estudio de caso de una plataforma Authors How to cite in APA Keywords Palabras clave*. *2025*, 876–887.

Lunnisa, U., Pathoni, H., & Hais, Y. R. (2022). Perancangan Alat Pengukur Kecepatan dan Kekuatan Tendangan Serta Pukulan pada Beladiri dengan Sensor Force Sensing Resistor (FSR) Dan Nodemcu ESP32. *Journal of Electrical Power Control and Automation (JEPCA)*, *5*(1), 11. https://doi.org/10.33087/jepca.v5i1.69

Mesra, R. (2023). Research & Development Dalam Pendidikan. In *Https://Doi.Org/10.31219/Osf.Io/D6Wck*.

Pratama, M. S. Y., & Hamdani. (2024). Pengaruh Pecing Pad Terhadap Minat Dan Hasil Belajar Siswa Materi Pencak Silat. *Jurnal Pendidikan Olahraga Dan Kesehatan*, *12*(01), 1–6.

Rahayu, Mardela, R., Sari, D. P., & Haryanto, J. (2024). Pengaruh Latihan Kekuatan Otot Tungkai Dan Kelentukan Pinggang Terhadap Kecepatan Tendangan Sabit Pada Atlet Pencak Silat PSHT Di Padang Sarai. *Gladiator*, *4*(5), 1968–1978.

Rarasti, A., & Heri, Z. (2019). Pengembangan Alat Bantu Latihan Samsak Berbasis Traffic Light Terhadap Kecepatan Reaksi Tendangan Pada Atlet Taekwondo. *Jurnal Prestasi*, *3*(6), 100. https://doi.org/10.24114/jp.v3i6.15902

Roy Try Putra. (2020). Sosialisasi Peran Iptek Dan Sport Science Dalam Meningkatkan Prestasi Koni Kabupaten Madiun. *Jurnal Pkmsisthana*, *2*(2), 77–86.

Safitri, M., & Aziz, M. R. (2022). ADDIE, sebuah model untuk pengembangan multimedia learning. *Jurnal Pendidikan Dasar*, *3*(2), 50–58. http://jurnal.umpwr.ac.id/index.php/jpd/article/view/2237

Setyawan, A., & Setiawan, I. (2022). Kondisi Fisik dan Teknik Atlet Pencak Silat Pagar Nusa Kabupaten Temanggung. *Indonesian Journal for Physical Education and Sport*, *3*(2), 449–460. https://doi.org/10.15294/inapes.v3i2.60635

Sugiyono. (2020). *Metodologi Penelitian Kuantitatif, Kualitatif dan R & D*.

Suprayitno. (2022). Journal physical health recreation. *Journal Physical Health Recreation*, *3*(1), 5–11.

Suryadin, T., Sahudi, U., & Kulyana, K. (2021). Pengaruh Latihan Tendangan Ke Atas Kursi Terhadap Keterampilan Tendangan Depan Pada Ekstrakurikuler Pencak Silat Di Smk Bina Insan Mandiri. *Journal RESPECS*, *3*(2), 45–52. https://doi.org/10.31949/respecs.v3i2.1270

Syamsiah, S., Purnomo, E., & Gustian, U. (2020). Pengembangan Alat Latihan Tangkapan Pencak Silat. *Jurnal Ilmu Keolahragaan*, *3*(2), 140. https://doi.org/10.26418/jilo.v3i2.42961

Triansyah, A., Atmaja, N. M. K., & Sepdanius, E. (2023). Video-based learning media for physical education. *Jurnal Maenpo : Jurnal Pendidikan Jasmani Kesehatan Dan Rekreasi*, *13*(2), 164. https://doi.org/10.35194/jm.v13i2.3740

Vai, A., & Ramadi, R. (2018). Korelasi Antara Kekuatan Daya Ledak Otot Kaki Dengan Kelincahan Tendangan Depan Pada Atlet Pencak Silat Pplp Pekanbaru Riau. *Journal Of Sport Education (JOPE)*, *1*(1), 27. https://doi.org/10.31258/jope.1.1.27-33

Widiastuti, W., Wardoyo, H., Hernawan, H., & Nuraini, S. (2020). Hubungan Prosentase Lemak Dan Berat Badan Dengan Agility Klub Pencak Silat Nusantara Dki Usia 11-18 Tahun. *Jurnal MAENPO: Jurnal Pendidikan Jasmani Kesehatan Dan Rekreasi*, *10*(2), 57. https://doi.org/10.35194/jm.v10i2.943

Yasi, R. M., & Nurcholis, M. (2019). Analisis Kekuatan Pukulan Atlet Beladiri Menggunakan Metode Pengukuran Matematis dan Alat Ukur Berbasis Mikrokontroller. *Journal Zetroem*, *01*(02), 20–23. http://ejournal.unibabwi.ac.id/index.php/Zetroem/article/view/1255