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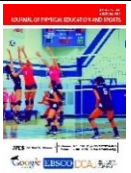

Development of Reaction Speed and Endurance Training Tools for Taekwondo Kick Speeds Using Pyongyo

Atika Swandana ✉, Sugiharto Sugiharto , Imam Santosa Ciptaning Wahyu

Universitas Negeri Semarang, Indonesia

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Abstract

The background of this research is the development of technology in coaching that was increasingly diverse and requires coaches to be able to adapt to the competition. The role of the trainer is not to be divided in concentration during training. This is important because during training the trainer's duty in addition to monitor the course of the training, the coach must also be able to analyze the results of the training. The purpose of this study was to develop a speed and endurance training tool for kick speed with sensors, LEDs, and digital accounting to be used to train kick speed and endurance in taekwondo athletes. This method of this research is Research and Development which has the following steps: Potential and Problems, Data Collection, Product Design, Design Validation, Design Revision, Product Trials, Product Revision, Usage Trials, Product Revision, Bulk Products. The results of this study are from the first taekwondo expert at stage I 93% good, stage II 95% very good. The assessment of second taekwondo experts at stage I is 75% good, stage II is 95% very good. The assessment of the first electro expert at stage I is 74% good, stage II is 95% very good. The evaluation of second electro experts in stage I is 90% very good, stage II is 95% very good. The evaluation process in trials for trainers in small group trials was 71% very good, in large group trials 89.37% was very good, in product trials 89.37% was very good.

✉ Correspondence address:
Kampus Pascasarjana UNNES Jl. Kelud Utara 3
Gajahmungkur Semarang
E-mail: atika.swandana@gmail.com

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INTRODUCTION

There are three kinds of taekwondo martial arts competed, namely: "pomsee" (moves), "kyurugi" (fighting), and "kyukpa" (show of expertise), but what is usually contested is the "kyurugi" (battle) and has been contested all over the world even entered the major Olympic events, then inaugurated as one of the most popular sports at the Sydney 2000 Olympics (Rozikin & Hidayah, 2015). The use of kicks in taekwondo is very dominant, there are various variations of taekwondo kicks, all must be done with high speed and accuracy (Handayani, Soegiyanto, & Rustiadi, 2018).

Taekwondo is a martial art with very significant development, one of these factors is because "taekwondo is a martial art from Korea, which in recent years has developed into an Olympic combat sport". At the 2012 London Olympics, protector scoring system (PSS) technology was used to automatically display the score on the scoreboard when sensors in the gait and body armor or head armor collide with each other in a technically correct manner. This requires coaches to change playing styles so that athletes can play more effectively and earn points more easily (Tatya Admaja & Sugiyanto, 2019).

Taekwondo prioritizes kicking attacks because the power of kicks is greater than the power of punches although there are many doctrinal and technical differences between the various taekwondo organizations, this art generally emphasizes kicks made from a moving stance, using greater reach and leg strength to immobilize an opponent from a distance. Taekwondo has many types of kicks that are very effective and deadly to bring down opponents during a match such as Dollyo Chagi, I and Dollyo Chagi, and Narae Chagi (Suryadi, YoYok, 2002: 32).

According to Subardjah (2000: 68), there are many factors that must be considered in coaching sports achievement, including clear coaching objectives, a systematic training program, appropriate training materials and methods, and evaluations that can measure the success of the coaching process itself. In addition, it is necessary to consider the characteristics of athletes who are fostered both physically and psychologically, the ability of the coach, facilities and infrastructure, and the conditions of the coaching environment (Soenyoto, 2014). The very rapid development of technology today has brought us to the era of modernization. Almost all aspects of human life are very dependent on technology, this is because the technology was created to help make it easier for humans to complete an activity/job (Eddi, Suhery, & Triyanto, 2013). Along with the development of technology in every sport, one of which is the sport of taekwondo, which is required to be able to and utilize technology, including the use of the development of training equipment models. The more tools that use technology, the more choice of tools that can be used as a means of practice (Rosman, 2017).

The athlete's potential to develop physical components includes elements of speed, reaction time, endurance, agility, coordination, power, fitness, and balance. Physical is the foundation of sports achievement because technique, tactics, and mentality will be well developed if you have good physical qualities. An athlete will develop his skills from basic techniques to advanced techniques when he has sufficient physique (Hendarto, Rahayu, Soegiyanto, & Safi'i, 2018).

Sensors are detectors that have the ability to measure certain types of physical qualities, such as pressure or light. The sensor will then be able to convert the measurement into a signal that someone will be able to read. Most sensors can be used when these will actually be able to communicate with electronic devices that will take measurements and record (Nurlina, Santosa, & History, 2017).

Understanding by using demonstrations will be clearer if it is strengthened by a training tool developed in the form of pyongyo which is equipped with digital accounting. This training tool is useful for making it easier for coaches to monitor the development of athletes. With this training tool, it is hoped that the training process can be increased and interesting. This training tool is intended for coaches and athletes to

increase kick speed and endurance (Faozan, Santosa, & Annas, 2017.

Research and development methods are methods used to produce certain products and test the effectiveness of the product. "Education and technology must develop in line to meet today's development challenges." In order to produce specific product requirements using analytical research and to test the effectiveness of these products for their functioning in the wider community, research is needed for the effectiveness of these products (Iskurniawan, Sugiharto, & Mukarromah, 2020).

Researchers obtained data by observing several matches and discussing with national coaches and interviews conducted on 15 December 2018 and 24 January 2019, such as:

Bambang Widjarnako: The technique that is done is quite good, it's just that in the form of speed and endurance, the speed is

less clearly measured and not recorded because there are no supporting facilities for doing the exercises.

Basuki Nugroho: The training facility is only in the form of pyongyo and does not support training speed and endurance in kick speed. Suyono: Lack of motivation and attractiveness of athletes to existing facilities so that athletes feel bored quickly in training sessions. Ponco Parangin Angin: There is no means of calculating the recording of the athlete's kick results so that the training for kick speed and endurance cannot be measured. Heru Chakra Lubis: The availability of an undeveloped training tool, so that training is only focused on one tool. Ageng: There are no supporting facilities for doing speed training and kick speed endurance, so it's a bit late compared to athletes who already have various training facilities. Ahad Aghafian Dhuha: It is very difficult to arouse their willingness to practice because they are not interested in that single training tool.

The speed and endurance of the kick speed is very lacking so that the speed and endurance of the kick are quickly decreased which ultimately have an impact on the potential for points and the final result of the match.

Table 1. Results of the interview analysis of the needs for the development of training tools for speed and endurance of kick speeds.

No	Name	Status	Province	Nedeed	
				Yes	No
1	Bambang Widjarnako	National Licensed Trainer	Central Java	✓	
2	Basuki Nugroho	National Licensed Trainer	North Sumatra	✓	
3	Suyono	National Licensed Trainer	North Sumatra	✓	
4	Ponco Perangin angin	National Licensed Trainer	North Sumatra	✓	
5	Heru Chakra Lubis	National Licensed Trainer	North Sumatra	✓	
6	Ageng	National Licensed Trainer	North Sumatra	✓	
7	Ahad Aghafian Dhuha	National Licensed Trainer	Central Java	✓	

The results of interviews by researchers with taekwondo coaches found that there was still a lack of and desperate need for speed training tools and endurance kick speed. So the researchers are interested in making innovative speed and endurance training tools for kicking speeds that can record the number of results and kick times of this tool adopted from Pyongyo. For this reason, the researcher conducted an R&D development research entitled "the development of a speed training tool and a taekwondo kick speed endurance using pyongyo".

METHOD

This research is development research which is usually referred to as research-based development (Sugiono. 2010: 297). This study aimed to develop pyongyo training tools for speed and endurance of kick speed with vibration sensors, LED lights, loudspeakers and digital

accounts that were used to train speed and endurance kick speed in taekwondo athletes. The development procedure according to Borg & Gall

the product's effectiveness in achieving the goal. This study used a procedural development model, where the model in this study was descriptive, which was a procedure that outlines the steps that must be followed in producing a product. The Borg & Gall procedure in Adila, (2017: 72-73) described ten steps for implementing the research and development strategy as follows 1) Research and data collection (research and information collecting) 2) Planning 3) Development of product drafts (develop a preliminary form of product 4) Preliminary field testing (preliminary field testing) 5) Revising the test results (main product revision) 6) Field testing (main field testing) 7) Improving the product field test results (operational product revision) 8) Field implementation test (operational field testing) 9) Final product revision 10) Dissemination and implementation.

The development procedure outlined above was exactly not absolutely necessary to follow development research steps. Each development research can determine and select the most appropriate steps in facing the research development process (Sugiyanto, 2010)

The development model in this research will be modified and simplified so that it can be implemented effectively and efficiently. The steps were research and data collection (research and information collecting), product planning (product planning), and product draft development (develop of product). The data obtained were in the form of quantitative and qualitative data. Quantitative data based on respondents 'assessment through questionnaires and qualitative data based on respondents' interviews are not structured as supporting research data (Fekie Adila, 2017).

RESULT AND DISCUSSION

The product produced in this study was a speed training tool and endurance taekwondo kick speed using pyongyo. This training tool basically consists of two main objectives, they were (1) developing the product, and (2) testing

contained components such as during a match on the field. In this tool, the trainer also makes it easy for the trainer to quickly analyze the number of calculations in the field through digital accounting. product development of training tools for speed and endurance of kick speed using pyongyo before the small-scale trial requires validation of the tool by an expert first. Tool validation is done to test the validity level of the tool before conducting the trial. The validity of the tool involved 4 expert validators, such as 2 electrical experts and 2 taekwondo experts. validation is carried out by a team of experts by observing the product development of speed training tools and kick speed endurance using pyongyo accompanied by an evaluation sheet along with a sheet of suggestions and input. evaluation sheet in the form of a questionnaire that contained aspects of product quality. The suggestion sheet was used as a revision and the input given to the researcher regarding the tools being developed. The evaluation results are in the form of values for aspects of product quality using a 1-4 rating scale with the following classifications:

Tabel 2. Percentage classification

Percentage	Classification	Meaning
75-100	Very Good	Very feasible
50-75	Good	Feasible
25-50	Good Less	Repair
0-25	Need to improve	Need to Repair

Source: Sugiyono dalam adiska (2017: 68)

Evaluation by taekwondo expert, taekwondo coach. The data obtained from the first stage of validation was carried out on the expert validators of taekwondo, namely Bp Bambang Widjanarko, MM and Bp Ahad Aghafian Dhuha in November 2019 in Semarang which resulted in reports that the tools were working in principle according to the function that had become the main goal, but in The first stage testing of the tool often experiences errors in performance, namely the lack of sensitivity of

the sensor so that Pyongyo is kicked unreadable results on the digital accounting display because it still uses one sensor so that a good revision of the sensitivity level is needed related to the addition of a vibration sensor. Following are the results of the first validation by a taekwondo expert.

Table 3. Results of product validation of small scale trials by Taekwondo experts

No	Experts Validator	Score Total	Percentage	Criteria
1	A1(Bp.Bambang Widjanarko)	36	93	Very Good and feasible to use
2	A2(Bp.Ahad Aghafian)	30	75	Good and feasible to use

The first electrical engineer to become a validator in the study was a lecturer in the Department of Electronics Engineering, Semarang State University. The second electrical engineer is a lecturer in the Department of Electronics Engineering, Semarang State University. The data were obtained by giving the product the developed speed and endurance training tools for the kick speed and accompanied by an evaluation sheet for electrical experts in the form of a questionnaire. The validation is carried out by electrical experts through two stages. Stage I is the expert's assessment of the developed kick speed and endurance training tools and suggestions for improvement of the initial product. Stage II is the assessment of the electrician on the speed and endurance training tools developed and improved in the first stage. The results of product validation by electrical experts and the average score given for the quality aspects of the tool and content. More clearly can be seen in the following table:

Tabel 4. Results of Validation by Electronics Experts at Trials Small Scale

No	Experts	Score Total	Avarage	Criteria
1	B1(Dr. I Made	29	74.5	Good and feasible to use
2	B2(Dr. Djuniadi)	36	90	Very Good and feasible to use

Table 5. Results of product validation trials on a large scale by a Taekwondo expert

No	Experts	Score Total	Avarage	Criteria
1	A1(Bp.Bambang Widjanarko)	38	95	Very Good an feasible to use
2	A2(Bp.Ahad Aghafian)	38	95	Very Good an feasible to use

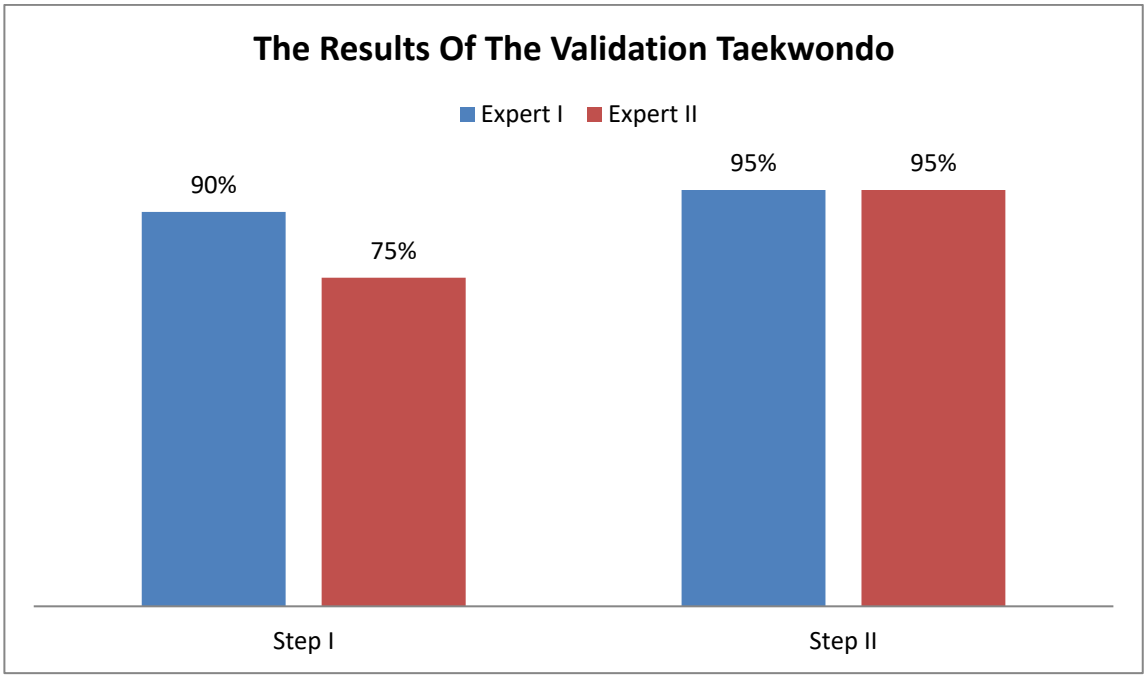

Figure 1. Comparison of the percentage of results of the validation of small-scale and large-scale taekwondo experts

Table 6. Results of Product Validation at Large Scale Trials by Electronics Experts

No	Experts	Score Total	Avarage	Criteria
1	Expert I	38	95	Very Good and feasible to use
2	Expert II	38	95	Very Good and feasible to use

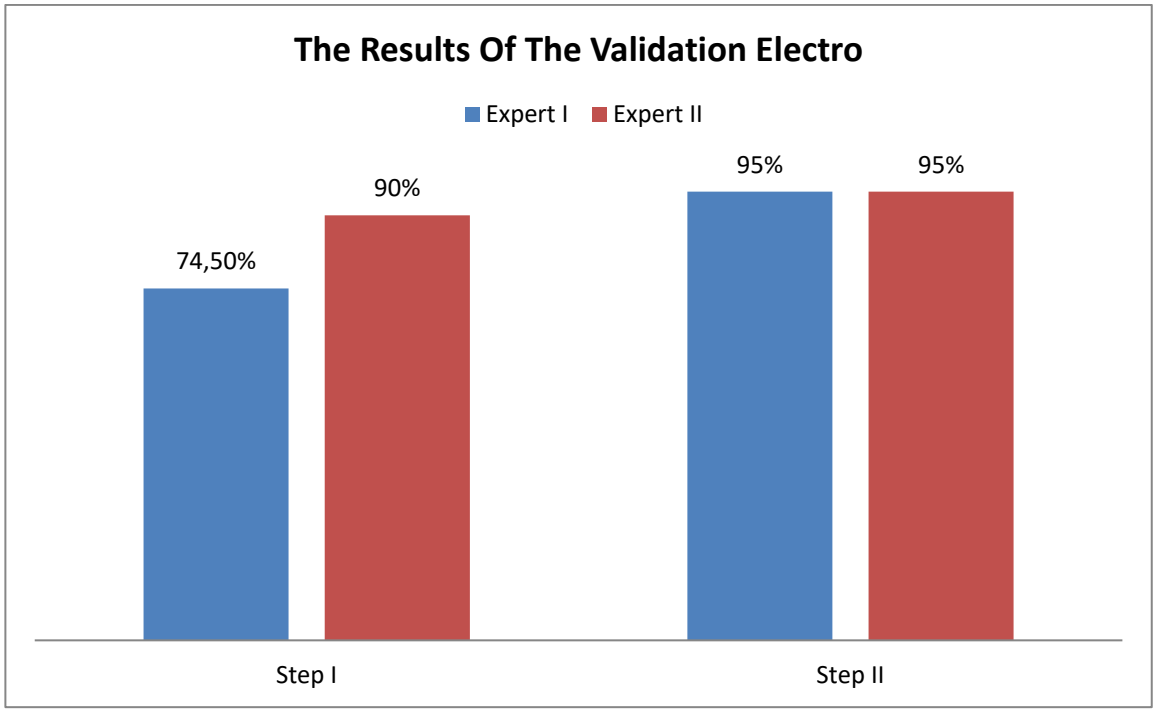

Figure 2. Comparison of the average percentage of validation results from small-scale and large-scale electrical experts

Table 7. Trial small scale results

Subject	Result Score	Maximum Score	Percentage	Category
Athlete	284	400	71	Feasible

From the table above, in the small group trial the assessment of 10 athletes got a score of 284 out of a maximum score of 400 with a percentage of 71%. With this percentage, the product of the development of a tool for developing speed training tools and the endurance of taekwondo kick speed using pyongyo is included in the "feasible" category.

Table 8. Large Scale Trial Results

Subject	Result Score	Maximum Score	Percentage	Category
All star Taekwondo Athlete	374	400	93.5	Very Appropriate
Ponco Team Taekwondo Athlete	348	400	87	Very Appropriate
Mabar Taekwondo Athlete	355	400	88.75	Very Appropriate
Atlit Taekwondo PAB	353	400	88.25	Very Appropriate
Total Score	1430	1600	89.37	Very Appropriate

In the table above,the trial large-scale showed that the assessment of 40 athletes who came from 4 different groups of athletes got a total score of 1430 from a maximum score of 1600, with a percentage of 89.37%. With this percentage, the product of developing a tool for developing speed training tools and endurance for the speed of taekwondo kicks using pyongyo is included in the "Very Appropriate" category.

Table 9. Results of Large Scale Trials of Trainers

Subject	Result Score	Maximum Score	Percentage	Category
Pelatih Taekwondo	229	240	95.41	Very Appropriate

From the table above, in the trial large-scale, the assessment of 4 trainers who came from 4 different groups of athletes got a total score of 229 out of a maximum score of 240, with a percentage of 95.41%. With this percentage, the product of the development of a tool for developing speed and endurance training tools for the speed of taekwondo kicks using pyongyo is included in the "Very Appropriate" category.

Based on the results of product trials on small-scale and trial large-scale, it can be seen that the product of the tool development has a good aspect of effectiveness because this product is easy to use and the existing components are in accordance with the needs of training analysis for coaches and athletes, so that it can achieve the coach's analysis goals. Thus, this product also contains very good efficiency, product eligibility meets the "Very Appropriate" criteria because this tool can be used for all categories.

DISCUSSION

The product developed by the researcher was a speed training tool and kick speed endurance. This development product is in the form of an exercise tool adopted from Pyongyo. The next stage that will be carried out by the researcher is to make a product by going through stages, such as: (1) collecting information in order to find the problems that occur so that these problems can become a potential which becomes the basis for researchers to make research concepts; (2) developing the initial product form, in the form of a speed training tool design model and kick speed endurance; (3) expert validation, carried out by electrical experts and taekwondo experts; (4) product revisions,

carried out by electrical engineers and taekwondo experts; (5) testing, testing of the products produced, both from small-scale trials and large-scale trials; (6) product revisions, carried out by experts in order to get the perfect product; (7) the final product, improving the product to be effective and producing the expected product from the development of speed training tools and kick speed endurance.

This was supported by previous research and development research (Faozan, Santosa, & Annas, 2017) with the title "development of sensors to measure an athlete's endurance when kicking in taekwondo." The end result of this research and development activity was a product measuring the endurance of athletes when doing deep kicks. Taekwondo. In the initial data validation conducted by experts in electrical engineering and taekwondo, the results of the interpretation awere in very good categories with a scale of 81-100. Then it was tested on a small scale at Dojang TC, Semarang City, the results showed that the tool was not effectively used for measurement because the output produced on a laptop in the form of a graph was inaccurate, then revised and tested on the small scale ii and the results showed that the tool could be used for measurement. After the small-scale trials, I and II were directly tested on a large scale in Central Java pplop and the results or responses from athletes were quite good. From the data, athletes and coaches say that the tool can be used or effective for measuring the endurance of athletes when making kicks.

CONCLUSION

The product of taekwondo kick speed and endurance training tools using pyongyo has been produced. This product can be used for the quick evaluation process of a taekwondo trainer during training. The assessment of experts in small-scale trials with large-scale trials are in the very good category. The results of large-scale trials showed that the product is functioning properly and properly and has a more helpful influence on the trainer in evaluating the results of the exercise. The results of product trials on small and large-scale trials, it appears that the product tools developed have a good aspect of effectiveness because the product is easy to use and the existing components are in accordance with the needs of training analysis for coaches and athletes, so as to achieve the objectives of coach analysis.

Suggestion. For taekwondo clubs they can use the product of speed training tools and kick speed endurance using pyongyo as a means of facilitating the evaluation process of athletes. For taekwondo administrators training tools for speed and endurance of kick speed using pyongyo can be disseminated and given to taekwondo trainers in areas that have not used technology to support the success of the coach

REFERENCES

Eddi, Suhery, C., & Triyanto, D. (2013). Sistem Penerangan Rumah Otomatis Dengan Sensor Cahaya Berbasis Mikrokontroler. *Tugas Akhir*, *01*(2), 1–10.

Faozan, M., Santosa, I., & Annas, M. (2017). Development of A Sensor For Measuring Endurance Athletes While Doing A Kick in Tae Kwon Do. *Journal of Physical Education*, *6*(3), 177–182. Retrieved from http://journal.unnes.ac.id/sju/index.php/peshr

Fekie Adila, T. R. & S. R. (2017). Journal of Physical Education and Sports Pengembangan Sistem Informasi Manajemen Tenis Meja Pengurus Provinsi Persatuan Tenis Meja Seluruh Indonesia (PTMSI) Jawa Timur. *14 Jpes*, *6*(1), 14–21. Retrieved from http://journal.unnes.ac.id/sju/index.php/jpes

Handayani, D., Soegiyanto, & Rustiadi, T. (2018). Development of Materials Guide Increasing Taekwondo Level of Sragen Regency in 2018. *Journal of Physical Education and Sports JPES*, *7*(16), 158–162.

Hendarto, S., Rahayu, T., Soegiyanto, S., & Safi'i, M. (2018). The Development of Physical Potential Instrument of Taekwondo Ages 14-17. *Advances in Social Science, Education and Humanities Research*, *247*(Iset), 437–442. https://doi.org/10.2991/iset-18.2018.88

Iskurniawan, M. A., Sugiharto, & Mukarromah, S. B. (2020). The Development of Virtual Reality-Based Basketball Arbitration Simulation Tools.

Journal of Physical Education and Sports, *9*(2), 159–165.

Ita, S. (2017). The Influence of The Practice Method and Speed on Dwi Chagi Exposive Power. *Cakrawala Pendidikan*, *36*(3), 446–457.

Lestari, H. (2017). Pengaruh Latihan Hurdle Jump (Lompat Rintangan) Terhadap Peningkatan Kemampuan Kecepatan Tendangan Sabit Kegiatan Ekstrakurikuler Pencak Silat pada Siswa Putra SMP Negeri 19 Palembang. *Sport, Health and Recreation*, *6*(3), 171–176. https://doi.org/10.15294/active.v6i3.17107

Rozikin, A., & Hidayah, T. (2015). Hubungan fleksibilitas dan kekuatan otot tungkai terhadap hasil tendangan eolgol dollyo-chagi pada olahraga taekwondo. *Journal of Sport Sciences and Fitness*, *4*(2), 2–5. https://doi.org/10.2307/4089344

Setiawan, M. R., Soekardi, & Rumini. (2015). Pengembangan Media Pembelajaran Aktivitas Ritmik Berbasis Multimedia Pada Pendidikan Jasmani Olahraga Dan Kesehatan Di Sekolah Menengah Kejuruan (Smk) Kabupaten Ogan Komering Ulu (Oku) Selatan Provinsi Sumatera Selatan. *Journal of Physical Education and Sports*, *4*(2), 172–178.

Soenyoto, T. (2014). Pengembangan Prototipe Alat Jamur Cabang Olahraga Senam Artistik Putra Di Provinsi Jawa Tengah. *Journal of Physical Education Health and Sport*, *1*(1), 1–8. https://doi.org/10.15294/jpehs.v1i1.3005

Sugiyanto. (2010). Pengembangan Alat Ukur Keterampilan Dasar Bermain Softball. *Jurnal Cakrawala Pendidikan*, *3*(3), 2–3. https://doi.org/10.21831/cp.v3i3.358

Tatya Admaja, A., & Sugiyanto, F. X. (2019). The Development of the Kick Abhorigi Chagi Instruments of Kyorugi Taekwondo Athletes. *Advances in Social Science, Education and Humanities Research*, *278*(YISHPESS), 416–419. https://doi.org/10.2991/yishpess-cois-18.2018.105

Universitas Nusantara PGRI Kediri, *01*(1), 1–7. Retrieved from http://www.albayan.ae

Novieanto, A. Y., & Himawan, W. (2018). Pengaruh Latihan Ladder Drill Crossover Shuffel Terhadap Peningkatan Kecepatan. *Kesehatan Olahraga*, *02*(7), 182–192.

Nurlina, D. F., Santosa, I., & History, A. (2017). The The Development of Biometric Sensors to Net Sports Volleyball. *Journal of Physical Education,*