Volume 05 Issue 01 (2024) Pages 13-24

INSPIREE:
INDONESIAN SPORT INNOVATION REVIEW

ISSN 2746-6965 (Online), 2774-2520 (Print)
Journal Homepage: https://inspiree.review/index.php/inspiree

BASIC SCIENCES

OPEN ACCESS

Development of Speed Training Equipment and Dollyo Chagi's Taekwondo Kick Speed Endurance Using Pyongyo

https://doi.org/10.53905/inspiree.v5i01.125

*Farid M. Alhumary[1abcde], Atika Swandana[1abcde], Wahyu Alexandrian Sirait[1abcde], Yessy Veronika Simangunsong[1abcde]

[1]*Sekolah Tinggi Olahraga dan Kesehatan Bina Guna, Medan, Indonesia.*

A B S T R A C T

The purpose of the study. The context of this research is that coaches and trainers must be able to adapt to competition as a result of the continuously changing technological landscape in the coaching process . Staying focused throughout training is the trainer's responsibility. This is important because, in addition to monitoring training progress, the trainer's role during sessions also requires the ability to evaluate programme results. To train the speed and endurance of kicks for taekwondo players , this research aims to design a speed and endurance training tool for Dollyo kicks. Chagi uses sensors, LEDs and digital accounting.

Materials and methods. The following processes form a research methodology called research and development, which include: potential and problems; data collection; product design; design validation; design revision; product trials; product revision; and mass production.

Results. Based on research, 93% of Taekwondo I experts are good at stage I, and 95% are very good at stage II. The assessment for stage I was 75% good, while stage II was 95% very good, according to Taekwondo II experts. Electrical expert I gave a good rating of 74% for stage I and a very good score of 95% for stage II. The Phase I assessment for Electrical Expert II was 90% very good, and the Phase II assessment was 95% very good.

Conclusions. In small group testing, 71% of trainer evaluation methods were considered very good; large group testing was 89.37%; and product testing was 89.37%.

A R T I C L E I N F O

Article History:
Received: November 11, 2022
Accepted: January 27, 2023
Published: January 27, 2024

Keywords: *tool development; speed and endurance; taekwondo.*

INTRODUCTION

There is competition in three taekwondo martial arts styles: "pomsee" (stance), "kyurugi" (fighting), and "kyukpa" (skill demonstration). Fighting bouts, or "kyurugi," are the most popular kind of competition and have been a part of significant

*Corresponding Author: Farid M. Alhumary, e-mail: malhumary@gmail.com

[abcde]Authors'Contribution: a-Study design; b-Data collection; c-Statistical analysis; d-Manuscript preparation; e-Funds collection.

international events. According to Ahadiyyah, S. (2020), this sport debuted as one of the most well-liked ones at the 2000 Sydney Olympics. Kicks are frequently utilized in taekwondo matches. According to Wahyuri AS (2019), there are various taekwondo kicks, and each one needs to be executed swiftly and precisely. Taekwondo has grown tremendously, partly because it is a "martial art of Korean origin, which in recent years has developed into an Olympic combat sport". When sensors in the head, body, and leg protectors interact with one another in a technically sound manner, scores are automatically displayed on a scoreboard at the 2012 London Olympics thanks to the Protector Scoring System (PSS) technology.

Coaches need to modify their playing strategies so that athletes can play more effectively and score points more readily, as stated by Arfanda et al. (2022). In taekwondo, kick assaults are prioritized due to their greater force than Ginting NAL (2023) fists. Though the game Taekwondo is practiced as pressure kicks from a moving position, employing more leg strength and reach to knock out an opponent from a distance, The discipline is extremely distinct in philosophy and technique. Taekwondo provides a range of strong kicks, such as dollyo narae chagi, that can be utilized to immobilize an opponent during fighting. The ability to enhance kicks Dollyo Chagi and Hasanah (2021) is then covered in this area. A few of the several components that are crucial for sports performance coaching at Wahyuri AS (2019) are precise coaching objectives, systematic training schedules, suitable training aids and methods, and evaluations that show how well the coaching process is working. In addition, factors like the caliber of the coach, the infrastructure and facilities, the coaching atmosphere, and the physical and mental attributes of the athletes need to be taken into account. In Mylsidayu A (2022). We're entering a modern age thanks to technology's extremely quick progress. We are currently in the midst of a modernization period because of how quickly technology is developing. Technology became a significant component of practically every aspect of human life because it was created to make jobs easier for humans Agustian N (2021) Every sport has seen technological advancements, and Taekwondo is no exception. To keep up with the most recent advancements, players need to have access to the newest training gear. According to the statement (Febriani

& Dewi, 2019), the variety of tools that are useful is growing along with the quantity of tools that make use of technology.

The obligation of an athlete is to increase the capacity to develop physical attributes such as strength, endurance, agility, coordination, speed, response time, balance and fitness Wiguna (2021). Sports success is built on physicality because having good physical attributes can help improve technique, tactics and mental toughness. When an athlete has the right physique, he or she will progress from basic to advanced techniques (Syamsiah et al., 2020). Sensors are detectors that can measure many of the physical qualities that occur, such as light or pressure. The measurements can then be translated by the sensor into a signal that can be read by a person. When sensors can actually be connected to the electrical equipment that will record and measure data, they can be used almost around the clock (Savitri, 2019). If a training tool in the form of Pyongyo equipped with digital accounting is used to strengthen understanding through demonstrations, the results will be more real. This training aid is useful for helping coaches monitor athlete development more easily. It is intended that this training tool can make teaching more interesting and effective. Coaches and players can use this training aid to increase kicking speed and endurance (Nebahatqoru et al., 2021). Methods for producing specific items and evaluating their efficacy are known as research and development methods. "Education and technology must develop simultaneously to meet today's development challenges." Studies regarding the efficacy of these products are needed to determine the need for specific products through analytical studies and to evaluate how well these products work in the broader community (Boateng et al., 2018).

Next, an initial needs analysis study was carried out on 7 people who were competent in their respective fields. Speed and kick endurance training equipment is still lacking and is urgently needed, based on the findings of research interviews conducted with taekwondo instructors . To train kick speed and endurance, researchers are interested in developing new instruments that can track kick results and timing. Pyongyo is the source of this instrument.

MATERIALS AND METHODS

Study participants

An initial needs analysis study was carried out on 7 people who were competent in their respective fields. Speed and kick endurance training equipment is still lacking and is urgently needed, based on the findings of research interviews conducted with taekwondo instructors.

Study Organization

The term "research-based development" or "development research" refers to this kind of study. W. Yuliani (2021) :18 This project attempts to develop a Dollyo kick speed pyongyo training tool employing vibration sensors, LED lights, loudspeakers, and digital accounts. In this field, taekwondo practitioners receive training from Chagi. In a study by Umar et al. (2023), Borg & Gall state that the development process primarily has two main aims: (1) creating goods; and (2) evaluating how well those products accomplish goals. This study employs a procedural development model, which is a descriptive process that lists the actions that have to be taken in order to produce a product.

The Borg & Gall procedure in Mustafa (2022) explains to implementation to 10 step research and development strategies as follows: 1) Research and data collection 2) Planning 3) create a preliminary product form 4) conduct preliminary field testing 5) final product revision 6) main field testing 7) Operational product revision 8) operational field testing; 9) final product revision 10) dissemination and implementation. Of course, following the development techniques mentioned above is not a necessity when conducting research and development. Every development researcher is able to determine and choose the best course of action when facing their own research process (Ellis & Levy, 2010). To enable effective and efficient implementation, the development model used in this research will be adjusted and simplified according to Juniar's statement (2019). Product planning, product development, as well as research and data collection are the steps. Both quantitative and qualitative data are present in the data collected. Qualitative data resulting from

respondent interviews and quantitative data based on respondent evaluations through questionnaires are not compiled as research-supporting data (Busetto et al., 2020).

RESULTS AND DISCUSSION

The final result of this research is a taekwondo kick speed tool based on Pyongyo-based Dollyo Chagi. The training aid includes elements that replicate actions in the field during the course of research. Coaches can also easily and quickly check the number of counts on the field by using digital accounting with this instrument . Before being tested on a limited scale, the Dollyo Chagi kick equipment that uses pyongyo needs to undergo validation by professionals in the field of speed and endurance training. Before the trial was carried out, the level of validity of the instrument was tested through tool validation; namely, four expert validators—two electrical experts and two taekwondo experts—were involved in ensuring the authenticity of the tool. An expert team validated the process by watching as Pyongyo was used to create a training tool for kick speed and kick endurance. It also included an assessment sheet and a page with suggestions and feedback. A questionnaire comprising factors of product quality makes up the evaluation sheet. Suggestion sheets are used for updates and feedback to researchers on the instruments under development. The evaluation results are displayed in Table 1 as ratings for several elements of product quality using a 1-4 assessment scale with categorization:

Table 1. Percentage Classification Source: Sugiyono in Adiska (2017: 68)

Percentage	Classification	Meaning
75 – 100%	Very good	Very Worth Using
50 – 75%	Good	Proper to use
25 – 50%	Not good	Fixed
0 – 25%	Not good.	Not Suitable for Use

Assessment by a trainer or taekwondo specialist, the research results show that even though in principle the tool functions as it should, errors often occur during the first stage of testing, such as insufficient sensor sensitivity, causing Pyongyo to display illegible findings on the digital accounting display because it still only has one sensor. Therefore, a thorough revision of the sensitivity level is required regarding the incorporation of vibration sensors. The findings of early validation by taekwondo specialists are shown in Table 2 below.

Table 2. Results of Small Scale Trial Product Validation by Taekwond Experts

No	Expert Validator	Total Score	Percentage	Criteria
1	A1	36	93%	Very good and worth using
2	A2	30	75%	Good and very worth using

Data collection was carried out by providing speed and endurance training equipment products specifically designed for kick speed, as well as assessment sheets in the form of questionnaires intended for electrical specialist doctors. Electrical specialists perform validation in two steps. Phase I consisted of expert evaluation of training aids created for Dollyo Chagi's kicking speed and endurance as well as recommendations for improving the original product. The kick speed training tool that was perfected in the first step was evaluated by an electrician in stage II. product validation results by electrical experts and overall ratings for tool quality and content The table that will be described below makes this clear:

Table 3. Results Validation by Electronics Experts Small Scale Trial

No.	Expert Validator	Score	Average	Criteria
1	B1	29	74.5%	Good and worth using
2	B2	36	90%	Very good and very worth using

(Source: Researcher Data)

Table 4. Results of large-scale trial product validation by Taekwondo experts

No	Expert Validator	Total score	Average	Criteria
1	A1	38	95%	Very good and very worth using
2	A2	38	95%	Very good and very worth using

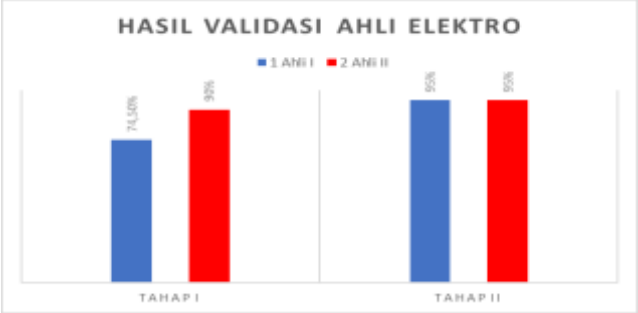
(Source: Researcher Data)

Graph 1. From small-scale and large-scale taekwondo experts

Table 5. Results of Large-Scale Trial Product Validation by Electronics Experts

No	Expert Validator	Total score	Average	Criteria
1	Expert I.	38	95%	Very good and very worth using
2	Expert II	38	95%	Very good and very worth using

(Source: Researcher Data , 2020)



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

Table 6. Results of small scale trials

Subject	Score obtained	Maximum score	Percentage	Category
Athlete	284	400	71%	Worthy

(Source: Researcher Data)

The evaluation of 10 athletes in small group trials resulted in a score of 284 out of a possible 400, or a percentage of 71%, based on the table above. With these proportions, the final result is the creation of Dollyo Chagi's taekwondo kick speed training aids, with Pyongyo included the “decent” group.

Table 7. Results of Large Scale Trials

Subject	Score obtained	Max score	Percentage.	Category
All star Taekwondo athlete.	374	400	93.5%	Very worthy
Taekwondo Poncho Team athletes	348	400	87%	Very worthy
Mabar Taekwondo Athlete	355	400	88.75%	Very worthy
PAB Taekwondo Athlete	353	400	88.25%	Very worthy
Total score	1430	1600	89.37%	Very worthy

(Source: Researcher Data, 2020)

As seen in the table above, a large-scale trial 40 athletes from four distinct athlete groups were evaluated, and the results showed an overall score of 1430 out of 1600, or 89.37%. According to these percents, the instrument used to create the speed and endurance training gear for Dollyo Chagi's pyongyo-based taekwondo kicks falls into the "very eligible" category.

Table 8. Results of Large-Scale Trials on Trainers

Subject	Score	Maximum score	Percentage	Category
Taekwondo trainer	229	240	95.41%	Very worthy

(Source: Research Data, 2020)

As can be seen from the table above, 4 coaches from 4 separate groups of athletes obtained an overall score of 229 out of a possible 240 in large-scale trials or 95.41%.

This percentage places the development of the Pyongyo-based Dollyo Chagi taekwondo kick speed and endurance training equipment product in the "Very Feasible" category. Based on the results of product trials on both small and large scales, it appears that the tool product developed has good aspects of effectiveness because it is easy to use and has components that suit the training analysis needs of coaches and athletes, allowing it to fulfil the coach's analytical goals. In addition, this product has excellent efficiency, and because it can be applied to all categories, its feasibility meets the "Highly Eligible (Very Eligible)" criteria. Researchers created a tool to train Dollyo Chagi's speed and kicks. This development product is sports equipment that uses Pyongyo . The researcher's steps in creating a product, which include several steps, include: (1) collecting data to identify potential problems and using this information as a basis for the research concept; (2) preparing the initial product form, namely the design of a model for kick speed and endurance training equipment; and (3) expert validation, carried out by specialist electrical and taekwondo doctors. The development of kick speed and endurance training equipment includes several stages, including: (4) product revision supervised by electrical technicians and taekwondo experts; (5) testing, which involves implementing the product through small- and large-scale trials; (6) expert product revision to achieve the ideal product; and (7) the final product, which is refined to provide the desired results. This is supported by previous development studies and research by Faozan et al. (2017), where a development research project entitled Sensor Development to Measure Athletes' Endurance When Kicking resulted in a tool to evaluate athletes' endurance when kicking in Taekwondo, as well as research conducted by Rarasti, A. (2019), who created a bag (samsak) training tool based on traffic light technology to increase the reaction speed of Taekwondo athletes' kicks.

CONCLUSION

Equipment for speed training for taekwondo kicks using pyongyo has been created and implemented. Taekwondo instructors or coaches can use this tool to quickly assess their athletes during training. Experts in small-scale trial evaluations put it in the good range. Large-scale testing findings show that the product works as

intended and has a greater beneficial impact for trainers when assessing training outcomes. The tool developed has good effectiveness aspects, as proven by the results of small and large-scale product trials. Its easy-to-use design and existing components meet the training analysis needs of coaches and athletes, allowing them to meet and assist the coaching team's analysis goals. Taekwondo clubs or training centres can simplify the athlete evaluation process by using Dollyo Chagi's kick speed training solution using pyongyo . In places where technology has not been used to increase trainer success, administrators can distribute and provide speed and endurance training tools to taekwondo trainers to utilise Dollyo Chagi's kick speed pyongyo.

REFERENCES

Agustian, N., & Salsabila, U. H. (2021). he Role Of Educational Technology In Learning. *Islamika*, *3*(1), 123–133.

Ahadiyyah, S. (2020). *Persuasive Communication Strategy between Coaches and Taekwondo Athletes at SDT Bina Ilmu*.

Arfanda, P., Puspita, L., & Wahid, W. (2022). *Implementation of Sports Science in the Development of Indonesian Disability Sports*. NEM Publishers.

Bafirman, B., & Wahyuri, A. (2019). *Formation Of Physical Condition*.

Boateng, G., Neilands, T., Frongillo, E., Melgar-Quiñonez, H., & Young, S. (2018). Best Practices For Developing And Validating Scales For Health, Social, And Behavioral Research: A Primer. *Frontiers in Public Health*, *6*(1).

Busetto, L., Wick, W., & Gumbinger, C. (2020). How To Use And Assess Qualitative Research Methods. *Neurological Research and Practice*, *2*(1).

Ellis, T. J., & Levy, Y. (2010). A Guide For Novice Researchers: Design And Development Research Methods. *Proceedings of Informing Science & IT Education Conference (InSITE)*.

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.

Febriani, N., & Dewi, W. (2019). *Consumer Behavior In The Digital Era: With Case Studies*. Brawijaya University Press.

Fikri, M. (2021). For High School Boys, The Effect of Explosive Power on the Long Jump (Tuck) Results. INSPIREE: Indonesian Sport Innovation Review, 3(01), 26–34. https://doi.org/10.53905/inspiree.v3i01.56

Ginting, N., & Henjilito, R. (2023). Level of Physical Condition of Taekwondo Club Athletes at Dojang Aha Taekwondo Rokan Hilir. *Journal of Integrated Education*, *3*(2).

Hasanah, W. (2021). *Communication in the Adaptation of Tae Kwon Do Athletes (Intrapersonal Study of Female Tae Kwon Do Athletes Wearing the Hijab in Pekanbaru)*. Riau Islamic University.

Juniar, D., Rohyana, A., & Rahmat, A. (2019). Development of a Group Discussion Learning Model to Increase Student Understanding and Learning Activities. *CHAMPION: Sports Journal*, *4*(1), 15–26.

Kuswari, M., Gifari, N. ., & Himarwan, A. (2021). Effects of Aerobic Endurance Training vs HIIT on Energy Intake, Macronutrient Intake, and VO2Max Level on Fitness Centre Participants. INSPIREE: Indonesian Sport Innovation Review, 2(3), 186–193. https://doi.org/10.53905/inspiree.v2i3.48

Loureiro, I., Moreira, R., Silva, R., Sampaio, J., Teixeira, T., Lourenço, R., Branquinho, L., Flores, P., Fortunato, A., & Forte, P. (2023). Comparison of photocell and stopwatch time in a 20 meter sprint: A case study of a non-trained analyst. INSPIREE: Indonesian Sport Innovation Review, 4(02), 55–64. https://doi.org/10.53905/inspiree.v4i02.117

Mustafa, P., & Angga, P. (2022). Product Development Strategies In Research And Development In Physical Education. *Journal of Education: Research and Conceptual*, *6*(3), 413–424.

Mylsidayu, A. (2022). *Sport Psychology*. Literary Earth.

Narvariya, P., & Singh, J. (2022). Shoulder Angle During Ball Release Are Predictors of Ball Velocity Among Medium Pace Bowlers. INSPIREE: Indonesian Sport Innovation Review, 3(02), 160–169. https://doi.org/10.53905/inspiree.v3i02.86

Nebahatqoru, M., Sagittarius, S., Purnamasari, I., & Novian, G. (2021). Six Weeks Of Resistance Band Training To Increase The Kicking Power Of Taekwondo Poomsae Athletes. *Multilateral: Journal of Physical Education and Sport*, *20*(3), 215–244.

Pardilla, H. (2021). Physical Fitness and Learning Achievement Academic in Children Aged 10-12 years . INSPIREE: Indonesian Sport Innovation Review, 2(2), 165 of 175. https://doi.org/10.53905/inspiree.v2i2.51

Rarasti, A., & Heri, Z. (2019). Development Of A Traffic Light-Based Bag Training Tool For Taekwondo Athletes' Kick Reaction Speed. *Journal of Achievement*, *3*(6), 100–104.

Sari, S., & Daryanto, Z. P. . (2023). The Effect of Kinesiotaping and Nerve Mobilization on Reduction of Doms . INSPIREE: Indonesian Sport Innovation Review, 4(03), 156–165. https://doi.org/10.53905/inspiree.v4i03.123

Savitri, A. (2019). *Industrial revolution 4.0: turning challenges into opportunities in the*

era of disruption 4.0. Genesis Publishers.

Syamsiah, S., Purnomo, E., & Gustian, U. (2020). Development of Pencak Silat Catch Training Tools. *Journal of Sports Science*, *3*(2), 140–148.

Syamsulrizal, S., Riski Afrianda, T., Iqbal, M., Marlina, Y. ., & Zahara, Z. (2022). Evaluation of Reaction Time on Karate Athletes UKM Syiah Kuala University. INSPIREE: Indonesian Sport Innovation Review, 3(01), 71–79. https://doi.org/10.53905/inspiree.v3i01.74

Umar, U., Purwanto, M., & Al Firdaus, M. (2023). Research And Development: As The Primary Alternative To Educational Research Design Frameworks. *JELL (Journal of English Language and Literature) STIBA-IEC Jakarta*, *8*(1), 73–82.

Wahyuri, A., Nurmai, E., & Emral, E. (2019). The Effect of Training Up and Down Stairs on Dwi Chagi's Kicking Ability at Taekwondo Athlete at the West Sumatra Regional Training Center. *MensSana Journal*, *4*(1), 90–95.

Wiguna, I. (2021). *Theory and Application of Physical Conditioning Exercises*. Raja Grafindo Persada.

Wardhani, R. ., & Yane, S. (2022). The Influence of Leg Muscle Exercises on the Taekwondo Kick Speed Technique of Dollyo Chagi at the Pontianak City NTC Club. INSPIREE: Indonesian Sport Innovation Review, 4(01), 01–07. https://doi.org/10.53905/inspiree.v4i01.107

Yuliani, W., & Banjarnahor, N. (2021). Development Research Methods (Rnd) In Guidance And Counseling. *Quanta*, *5*(3), 111–118.

APPENDIX

Information About The Authors:

Farid M. Alhumary, M.Pd:
Lecture of Physical Education, Health and Recreational Study Program, STOK Bina Guna Medan; Address: Jl. Aluminum Raya No.77, Tj. Mulia Hilir, Kec. Medan Deli, Medan City, North Sumatra 20241, Indonesia.

Atika Swandana, M.Pd:
Lecture of Physical Education, Health and Recreational Study Program, STOK Bina Guna Medan; Address: Jl. Aluminum Raya No.77, Tj. Mulia Hilir, Kec. Medan Deli, Medan City, North Sumatra 20241, Indonesia.

Wahyu Alexandrian Sirait;
Student of Physical Education, Health and Recreational Study Program, STOK Bina Guna Medan; Address: Jl. Aluminum Raya No.77, Tj. Mulia Hilir, Kec. Medan Deli, Medan City, North Sumatra 20241, Indonesia.

Yessy Veronika Simangunsong:
Student of Physical Education, Health and Recreational Study Program, STOK Bina Guna Medan; Address: Jl. Aluminum Raya No.77, Tj. Mulia Hilir, Kec. Medan Deli, Medan City, North Sumatra 20241, Indonesia.