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Development of A Validity and Reliability Taekwondo Technical Skill Test Instrument

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ABSTRACT
Objective: *This research aims to compile and develop valid and reliable Taekwondo skill test instruments that meet the competition and to develop test tools with standard norms and conversion values. The participants in this study are the athletes Puslatda Taekwondo Indonesia East Java and the region of Surabaya, 28 senior kyourugi male. The data collection method in this study uses quantitative descriptive, a research procedure using Research and Development (R&D) by Borg & Gall (2007:590). Data analysis used in this research uses Statistical Product and Service Solutions (IBM SPSS V.26), a data analysis technique used as a single correlation of Pearson's Moment Product.* ***Results:*** *The results of the Standard Operational Procedures (SOP) guidelines for implementing tests and measurement of Taekwondo skills, the Peta Chagi, Pyojeuk, and Jireugi maps, which are valid and reliable.* ***Novelty:*** *The innovation in this research is the creation of the Standard Operational Procedures (SOP) test and measurement techniques skills kicking and kicking that trainers can use to know the best kick of each athlete.*

INTRODUCTION

Taekwondo comes from Korea, Taekwondo means "Tae" is the leg, "Kwon" is a punch with the hand, and "Do" is an art. Taekwondo is a sport of achievement. Nowadays they have contested the sport of Taekwondo at various championship levels, ranging from the national level, such as single-event and multi-event, to the world's largest sports party Olympics. Some of the most frequently contested categories in the sport of Taekwondo are the Poomsae and Kyorugi categories.

Three important subjects in Taekwondo practice are the skills in the field itself (Taegeuk), the techniques of the breakdown of hard objects (Kyukpa), and the last is fighting in the Field of Taekwon-do (Kyourugi), under Suryadi's opinion (2008: 9) "in Taekwondo there are some basic techniques of attack that must be known: the technique of the punch (Jireugi), the punching (Maki), and kicking (Chagi). So we can define Taekwondo as the sport of skating that uses the legs and hands as a weapon of the skating to conquer its opponents. The popularity of Taekwondo has caused this art to flourish in various forms, like many other martial arts, and the sport of Taekwondo is a combination of wrestling techniques, physical behavior, and sport, of course. Fuadi (2016:66) argued that Taekwondo is the art of skating with the use of legs and hands, but in the practice of Taekwondo, the more practices jumping the more points got from the jumping match because almost 90% of the Taekwondo.

In Taekwondo, the most dominant technique used to attack is the foot or kick. (Chagi). We can see this from the video observation of the Baku 2023 Word Taekwondo

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Champions finals (https://youtu.be/2atb5g4KuDg) on the senior divisions of the son can be found in the table below:

Table 1. Senior rank equals sons under 74 kg.

Equal class	Athlete's name	Taekwondo technique									
		Kick (Chagi)									Punch (Jeurugi)
		Peta Chagi	Dollyo Chagi	Ceking Yeop Chagi	Pyojeuk Chagi	Dolke Chagi	Deol Chagi	Ap Chagi	Dwi Chagi	Yeop Chagi	
Under 74 kg	Marko GOLUBIC (CROASIA)	22	22	11	1	-	2	5	7	11	6
	Stefan TAKOV (SERBIA)	35	31	11	1	1	1	-	1	17	8
Total Kick		**57**	**53**	**22**	**2**	**1**	**3**	**5**	**8**	**28**	**14**

Athletes Kyourugi Taekwondo Indonesia has not yet had a chance to maximum achievement in the World and Asian championships. Still, Indonesia strives to maximize its achievements as Taekwondo Indonesia ranked fourth at the 2017 Sea Games. At the 2021 Sea Games held in April 2022, Taekwondo Indonesia achieved 4 medals, including 1 gold and 3 bronze. Improving performance does not depend on the proper construction system of every sport, especially Taekwondo, to build a sporting performance that focuses on the need for scientific research. The study of the development of science and technology sports affects the system of building sports performance, especially on the predictions in the physical and physiological aspects that can be prepared from the beginning for potential athletes.

Taekwondo is a branch of martial arts that has undergone a very rapid change through the development of modern technology, and its application in the sports branches, Taekwondo has been done, one of them like implementing the PSS (Protector Scoring System) in competition. The Protector scoring system (PSS) technology helps the referee reduce negative assumptions when determining points in a game. The latest matching equipment uses the base of sensors listed on foot, body, and head protectors. The development of PSS technology has been in place since the 2012 Olympics in London to this day, the pros and cons of technology development. Because this change concerns the technique and tactics of the match, thus, the coaches started designing training programs and competitive models that matched the PSS technology in Indonesia. Positive development of the Indonesian athletes need to know whether the training carried out during this time using the role of the sports by Design or the factor of luck and experience, so it felt necessary to have the training of the athlete by Design planned so that it would be expected to have a program of training measured through proper measurement so that test instruments that have been tested, valid and reliable. Based on a literature review and several relevant sources, such as research conducted by Ribeiro, et al. (2020), research focused on developing a system that can calculate the number and time of Taekwondo kicks. Aloui's research. (2022) focused on testing the validity and test-retest reliability of the Taekwondo technique change speed of movement direction test when kicking. Other research from Komaini, A. and Sukma, F.F. (2019), this research focuses on developing a sensor-based design for a Dollyo Chagi kick skill test instrument

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for Taekwondo athletes. Of the several studies for developing valid and reliable Taekwondo skills test instruments, specific for the Peta Chagi, Pyojeuk kicking and punching techniques (Jireugi).

In connection with the above, they focus this article on developing a valid and reliable Taekwondo technical skills test instrument that has norms and standard value conversions. The importance of development is: 1) Progress Evaluation: A good test can help coaches, athletes, and administrators measure the progress of Taekwondo skills. This allows athletes to know how far their skills have progressed and improved; 2) Training Quality Assessment: Taekwondo trainers can use test tools to assess the quality of the training they provide; 3) Evaluation Standards: Certain standards can evaluate a Taekwondo athlete's skills. This can help determine whether the athlete has achieved the expected skill level while practicing Taekwondo; 4) Motivation and Goals: Test instruments can motivate Taekwondo athletes; they can set certain goals and work hard to achieve them; 5) Safety Assessment: Creating test instruments can also help ensure athletes have sufficient Taekwondo skills to participate safely. This is important to prevent injury if participants do not have sufficient skills; 6) Competition Assessment: In Taekwondo competitions, test equipment can determine who is eligible to compete in a particular category. This can ensure athletes compete against people of comparable skill; 7) Professional Athlete Development: Tests are an important way to assess whether a person has the skills necessary to become a professional athlete successfully.

A good test instrument should consider various aspects of Taekwondo skills, such as basic technique, strength, agility, precision, and knowledge of the rules. Valid and reliable test instruments can improve Taekwondo training standards and ensure that athletes have adequate abilities to take part in training activities and competitions.

RESEARCH METHOD

The participants in this study are the athletes Puslatda Taekwondo Indonesia East Java and the region of Surabaya, 28 senior kyourugi sons. The data collection method in this study uses quantitative descriptive because in this research, it will test the validity and reliability of the test instrument. The research procedures used in this study are under the steps to use the Research and Development Method (R&D) by Borg & Gall (2007: 590).

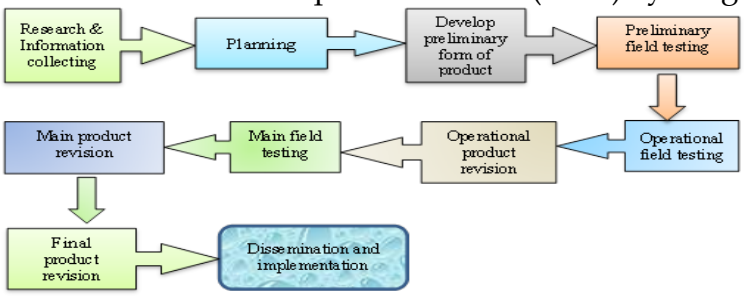


Figure 1. Development Procedure Design

Analysis of the data used in this research is a single correlation of Moment Products from Pearson using Statistical Product and Service Solutions (IBM SPSS V.26).

RESULTS AND DISCUSSION

Results

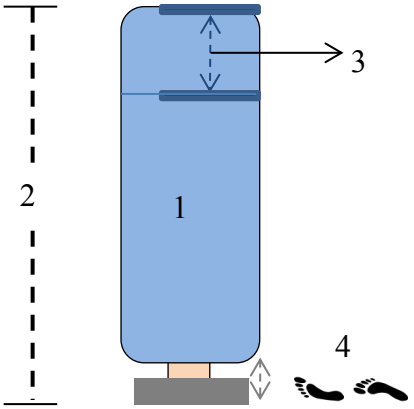
Based on the results of the Focus Group Discussion (FGD), researchers, and experts (Expert Judgement), the experts in question are certified professional coaches of Taekwondo. It also limited the issues discussed in the FGD to how to compile guidelines for implementing valid and reliable Taekwondo skill tests. Such limited discussion produced an early product that required small-scale field trials. As for the original product, they developed 3 (three) types of skill tests in Chagi and Pyojeuk kicking techniques and kicking (Jireugi) from the initial position distance, target performing kicking and kicking, until its evaluation should be. (2007: 590). Below are the Standard Operational Procedures (SOP) guidelines for implementing the test and measurement of Taekwondo skill techniques complete with the norms and conferences of their values:

Operational Standard Procedures (SOP) Technical Implementation Instructions Test and Measurement Skill Technicals Peta Chagi

OPERATIONAL STANDARD PROCEDURES (SOP) Technical Implementation Instructions Test and Measurement Skill Technicals Peta Chagi		
1. Operational Definition	:	The Peta Chagi kicking technique is the ability of an athlete to perform a kicking attack by raising the front leg forward, the knees bent, the thighs aligned with the floor, spreading the kicking leg and in a curved path like a bow from the outside to the inside.
2. Tools and Equipment	:	a. Arena/field sufficient (6 - 9 m2) b. Target (Punching Bag) c. Height meter d. Roll meter d. Stopwatch e. Whistle f. Duct tape g. Stationery (Assessment Format)
3. Test officer (Tester)	:	Two men, a scorer and a time observer.
4. Implementation Instructions	:	a. Prepare the test arena for the test of the Peta Chagi skill, the target test b. Measure the test height c. I adjusted the target of the test to the test height and the target height, according to the standard Head Protector, is 24 cm d. The Testee (the person on the test) stands in a position ready to perform the Peta Chagi mapping with the dominant leg position in front of the e. The testee takes the best position under the distance of the target or the target of a Peta Chagi kick f. The focus of the testee is straight towards the target. g. The hand in the relaxation position is ready to carry out the strike of the opponent from the moment of making a Peta Chagi kick. h. At the signal "yes"/whistle sound, the athlete kicks using the dominant leg in front and perform the Peta Chagi as fast possible and much towards the target for 10 seconds and stop when the test stops. i. Stopwatch starts/starts at the same time as the "yes" /whistle sound j. Each test is given a maximum of 3repetitions.

5. Assessment : Scores or values recorded as Peta Chagi kicking skills are the number of accumulations of the most kick in 10 seconds of 3 repetitions.

6. Notes : a. The number of Peta Chagi hits is counted once the kick starts from the dominant foot touching the floor and then lifts to do the kick to the target
b. When the finished kicking of the Dominant foot falls behind the target, then not recognized or not counted
c. If the target falls or shifts, then the test is repeated from the beginning
d. The focal foot should not be lifted (Jump)



Description:
1. Target
2. Target height based on average athlete height
3. Target height to head jaw according to Head Protector standard 24 cm
4. Target distance and front leg limit when kicking

Peta Chagi's kick target

SCORING TABLE
TAEKWONDO SKILLS TEST

Test Date: _____
Test Type: _____

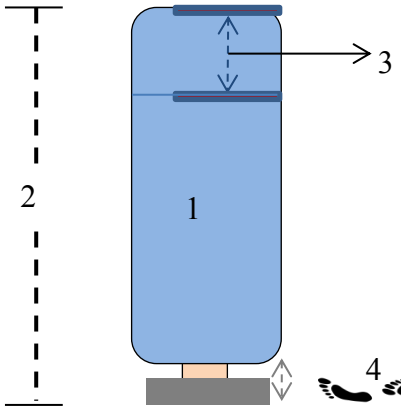
No	Athlete Name	Score			Total Score
		1	2	3	
1					
2					
3					
4					
Etc…					

TECHNICAL NORMS
WITH PETA CHAGI ATLET KYOURUGI SENIOR MALE

Classification	Class Interval
Excellent	20 – 21 or < 20
Good	18 – 19
Fair	16 – 17
Poor	14 – 15
Bad	12 – 13

Operational Standard Procedures (SOP) Technical Implementation Instructions Test and Measurement Skill Technicals Pyojeuk

OPERATIONAL STANDARD PROCEDURES (SOP) Technical Implementation Instructions Test and Measurement Skill Technicals Pyojeuk		
1. **Operational Definition**	:	Pyojeuk is an upward kick (Olgul) using the dominant leg, which is bent when the target hits the target with the head using the sole of the foot (Balbadag)
2. **Tools and Equipment**	:	a. Arena/field sufficient (6 - 9 m2) b. Target (Punching Bag) c. Height meter d. Roll meter d. Stopwatch e. Whistle f. Duct tape g. Stationery (Assessment Format)
3. **Test officer (Tester)**	:	Two men, a scorer and a time observer.
4. **Implementation Instructions**		a. Prepare an arena for testing Pyojeuk's kicking skills, mainly the test target b. Measure the testee's height c. The target or kick target is adjusted to the height of the testee and the height of the target according to the Head Protector standard, 24 cm. d. The testee (the person being tested) stands in a position ready to perform the Pyojeuk kick with the dominant foot in the front. e. The testee takes the best position according to the distance of the target or target from Pyojeuk's kick. f. Focus the testee's gaze straight towards the target. g. Hands in a relaxed position as if ready to block an attack from the opponent when executing Pyojeuk's kick h. At the signal "yes"/whistle sound, the athlete kicks using the dominant leg at the back and performs the Pyojeuk kick technique towards the target using the sole (Balbadag) like the front pad of the foot and performs as many Pyojeuk kicks as possible for 10 seconds and Stop at the stop/whistle sound. i. The stopwatch starts/starts at the same time as the "yes" /whistle sound j. Each testee is given a maximum of 3 repetitions
5. **Assessment**	:	The score or value recorded as Pyojeuk's kick technique skill is the highest number of accumulated kicks within 10 seconds of 3 repetitions.
6. **Notes**	:	a. Pyojeuk's number of kicks is counted as one kick starting with the dominant leg leaving the floor/lifting to kick at the target and returning to touch the floor b. If, after kicking the dominant leg, falls past the position (behind) of the target, it is not recognized or counted c. If the target falls or shifts, the test is repeated from the beginning b. d. The support leg must not be lifted (jumping)



Description:
1. Target
2. Target height based on average athlete height
3. Target height to head jaw according to Head Protector standard 24 cm
4. Target distance and front leg limit when kicking

Pyojeuk kick target

SCORING TABLE
TAEKWONDO SKILLS TEST

Test Date: _____
Test Type: _____

No	Athlete Name	Score			Total Score
		1	2	3	
1					
2					
3					
4					
Etc…					

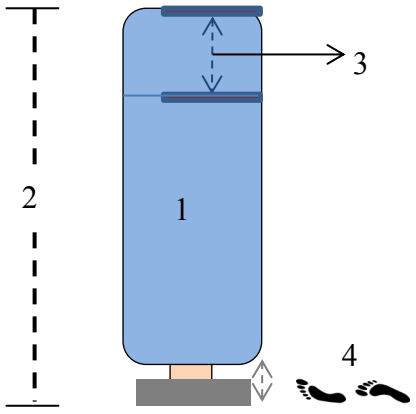
TECHNICAL NORMS
WITH PYOJEUK ATLET KYOURUGI SENIOR MALE

Classification	Class Interval
Excellent	18 – 19 or < 18
Good	16 – 17
Fair	14 – 15
Poor	12 – 13
Bad	10 – 11

Operational Standard Procedures (SOP) Technical Implementation Instructions Test and Measurement Skill Technicals Punch (Jireugi)

OPERATIONAL STANDARD PROCEDURES (SOP)
Technical Implementation Instructions Test and Measurement Skill Technicals Punch (Jireugi)

1. **Operational Definition** : A jireugi is a punch with a dominant hand.
2. **Tools and Equipment** :
   a. Arena/field sufficient (6 - 9 m2)
   b. Target (Punching Bag)
   c. Height meter d. Roll meter
   d. Stopwatch
   e. Whistle
   f. Duct tape
   g. Stationery (Assessment Format)
3. **Test officer (Tester)** : Two men, a scorer and a time observer.
4. **Implementation Instructions** :
   a. Prepare a test area for the test of punch skills (Jireugi) the test target
   b. Measure the height of the test body
   c. The target or target of the punch (Jireugi) is adjusted to the test height and the target height, according to the Head Protector standard, is 24 cm
   d. The punch target (Jireugi) based on the standard body protector size 49 cm
   e. The test stands in a position ready to perform a punch with the dominant leg position in the front and free distance close to the target
   f. The vision of the testee is straight towards the target.
   g. Hands in a relaxed position like a punch .
5. **Assessment** : The score or value recorded as punch technique skill (Jireugi) is the highest number of punches accumulated within 10 seconds of 3 repetitions.
6. **Notes** :
   a. If the blow does not return to the initial stance, it is not recognized or counted
   b. If the target falls or shifts, the test is repeated from the beginning
   c. The support leg must not be lifted (jumping)



Description:
1. Target
2. Target height based on average athlete height
3. Target height to head jaw according to Head Protector standard 24 cm
4. The target point of the punch is based on the standard Body Protector size of 49 cm
5. Target distance and front leg limit when Punch

Punch (Jireugi) target
SCORING TABLE
TAEKWONDO SKILLS TEST

Test Date: _____
Test Type: _____

No	Athlete Name	Score			Total Score
		1	2	3	
1					
2					
3					
4					
Etc…					

TECHNICAL NORMS
WITH PUNCH (JIREUGI) ATLET KYOURUGI SENIOR MALE

Classification	Class Interval
Excellent	37.5 – 41.5 or < 37.5
Good	32.5 – 36.5
Fair	27.5 – 31.5
Poor	23.5 – 26.5
Bad	18.5 – 22.5

Test the validity of Product Moment

Table 2. Validity of Taekwondo Skill Techniques

Descriptive Statistics

	Mean	Std. Deviation	N
Peta.Chagi	18.64	1.254	28
Pyojeuk	14.82	.723	28
Punch.Jireugi	30.93	1.215	28
Score_Total	64.39	2.644	28

Correlations

		Peta.Chagi	Pyojeuk	Punch.Jireugi	Score_Total
Peta.Chagi	Pearson Correlation	1	.499**	.542**	.860**
	Sig. (2-tailed)		.007	.003	.000
	N	28	28	28	28
Pyojeuk	Pearson Correlation	.499**	1	.491**	.736**
	Sig. (2-tailed)	.007		.008	.000
	N	28	28	28	28
Punch.Jireugi	Pearson Correlation	.542**	.491**	1	.851**
	Sig. (2-tailed)	.003	.008		.000
	N	28	28	28	28
Score_Total	Pearson Correlation	.860**	.736**	.851**	1
	Sig. (2-tailed)	.000	.000	.000	

Descriptive Statistics

	Mean	Std. Deviation	N
Peta.Chagi	18.64	1.254	28
Pyojeuk	14.82	.723	28
Punch.Jireugi	30.93	1.215	28
N	28	28	28

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation of the Product Moment validity test, based on the "Correlation" output, is known: 1) The calculated r value or Pearson Correlation value of the Peta Chagi with Total_Score is 0.860; 2) The calculated r value or Pearson Correlation value of Peyojeuk with Total_Score is 0.736; 3) The calculated r value or Jireugi's Pearson Correlation value with Total_Score is 0.851; 4) The r table value of the total data DF=N-2 (28-2=26) at a significance of 0.05% is 0.388.

Table 3. Interpretation of the Product Moment Validity Test

Test Items	Rxy	r tabel	Description
Peta Chagi	0.860	0.388	*Valid*
Pyojeuk	0.736	0.388	*Valid*
Punch (Jireugi)	0.851	0.388	*Valid*

Reliability Test

The basis for decisions in the Cronbach's Alpha Reliability test according to Sujarweni, V.W (2014: 193) explains that the reliability test can be carried out using two stages, namely: 1) If the Cronbach's Alpha value is > 0.60 / r table then the test item is declared reliable or consistent; 2) If the Cronbach's Alpha value is <0.60 / r table then the test item is declared unreliable or inconsistent.

Table 4. Reliability of the Taekwondo Skills Technique Test

Case Processing Summary

		N	%
Cases	Valid	28	100.0
	Excluded[a]	0	.0
	Total	28	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.734	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Peta.Chagi	45.75	2.861	.603	.603
Pyojeuk	49.57	4.698	.564	.703
Pukulan.Jireugi	33.46	2.999	.597	.603

Interpretation of the Cronbach's Alpha reliability test based on SPSS output it is known: 1) The Cronbach's Alpha value of the Peta Chagi is 0.603; 2) Cronbach's Alpha Pyojeuk value is 0.703; 3) Cronbach's Alpha Jireugi value is 0.603; 4) The r table value of the total data DF=N-2 (28-2=26) at a significance of 0.05% is 0.388.

Table 5. Interpretation of Cronbach's Alpha Reliability test

Test Items	Rxy	r tabel	Description
Peta Chagi	0.603	0.388	*Reliabel*
Pyojeuk	0.703	0.388	*Reliabel*
Punch (Jireugi)	0.603	0.388	*Reliabel*

Discussion

With the development of martial arts, Taekwondo in Indonesia in particular and in the world not little attracted the interest of academics or sports activists to research in Taekwondo sports among them: 1) Research conducted by Woo J.H., et al. (2013) "Development and Evaluation of A Novel Taekwondo Chest Protector to Improve Mobility When Performing Ax Kicks". This research aims to develop a chest protector, which is identified in biomechanical analysis. The subjects were 15 senior Taekwondo athletes. In this study, the athletes were asked to perform three styles of Ax Kick/Deol Chagi kicks such as Deol Chagi from the front 15 times, from the inside (In-Out) 15 times and from the outside. (In-Out-In) 15 kicks, so the total kick is 45 kicks. The results show that the new Chest Protector does not interfere too much with the lower and upper legs during the Deol Chagi kick and provides an alternative that is easier and freer to move when using the new chest protector; 2) Research conducted by Ribeiro et al. (2020), "Development and reliability of a kick test system for Taekwondo athletes". This research aims to develop a system that can count the number of kicks, measure time (in mill/seconds), and test its reliability. The subjects of this research were 17 Taekwondo athletes (15 male athletes and 2 female athletes) and black belts who had taken part in national and international championships. As a result, the developed system could identify 100% of the kicks performed by the athletes and showed to be very good and reliable. Video-based analysis could be used as a more workable tool for physical trainers. So, we can consider this kick test system as a reliable test for assessing high-intensity intervals in certain Taekwondo kicks; 3) Research conducted by Aloui (2022). "Reliability and Validity of a New Taekwondo-Specific Change-of-Direction Speed Test With Striking Techniques in Elite Taekwondo Athletes." This study examined the test-retest reliability and convergent and discriminative validity of a change-of-direction speed test specific to Taekwondo techniques. The research subjects were 20 senior athletes, comprising 10 male and 10 female athletes. The results were that the test showed a substantial correlation with Linear Sprint speed (r = 0.71 to 0.85) and dynamic balance (r = -0.71 and -0.74), a significant correlation with Change of speed -Direction (COD) (r = 0.57 to 0.60) and vertical jump performance (r = -0.50 to -0.65), and correlation of ability with horizontal jump performance (r = -0.34 to - 0.45) and static balance (r = -0.39 to -0.44). So, in conclusion, this test is a valid and sensitive test for evaluating Change-of-Direction (COD) speed in Taekwondo skills and is reliable when considering interclass Correlation Coefficients (ICC) and Typical Error of Measurement (TEM). Although the test's usefulness is questionable for detecting changes in performance in small-scale

populations, the test can detect ability changes in Change-of-Direction (COD) speed specific to Taekwondo.

Based on several studies conducted by academics and Taekwondo sports practitioners, they have developed various types related to the sport of Taekwondo, including: 1) Research focused on developing chest protectors (Body Protector); 2) Research focuses on developing a system that can count the number of kicks, measure time (in mill/seconds), and test the product's reliability; 3) The research focused on testing the test-retest reliability and convergent and discriminative validity of the change of direction and speed test on Taekwondo techniques.

The results of the theoretical studies and empirical studies above can be used as a basis for developing several techniques that suit the needs when competing, including, according to Suryadi (2008:9), basic Taekwondo technical skills, punching, kicking, dodging, slashing and stabbing, while according to Prajuli. D. (2022: 23-107) There are 8 basic Taekwondo technical skills: Makki (scratch), Bal / Chagi (foot) or Kick, Palkup (elbow) elbow or Chigi (Hitting) or slash, Palmok (forearm, especially the wrist part) or arm, Son (hand) or Stab, Jumeok/Jireugi (Punch), and Seogi (stance).

CONCLUSION

Fundamental Findings: From a series of product development results and discussions carried out in this research, the following conclusions can be drawn: (1) The technical skills developed in this research are 2 (two) types of Taekwondo technical skills, kick techniques comprising Peta Chagi kicks and kicks. Pyojeuk and punching techniques (Jireugi) (2) The product developed in this research is a Standard Operating Procedure (SOP) for implementing tests and measuring valid and reliable Taekwondo technical skills. **Implications:** they relate the implications of the results to the development of Taekwondo technical skills test instruments for research subjects or Taekwondo athletes. I expected the results to become a reference or guideline for testing and assessing the ability of Taekwondo technical skills, wildly kicking techniques such as Peta Chagi, Pyojeuk, and punching techniques. (Jireugi**). Limitation:** Limited resources: Limited budget, time, and research personnel, so the next researcher, before conducting research, should pay attention to the resources to be researched, such as the amount of budget available and sufficient time during data collection and choose as much competent research personnel as needed during data collection and sample limitations: Sample selection was limited to male senior kyourugi athletes and two different IT provincial regions, the East Java IT Provincial Surabaya region and the NTB IT Provincial Pengprov Lombok region. I expected future researchers to observe the availability of the number of athletes or subjects to be studied. **Future Research:** Based on these limitations, there is great hope for future researchers to develop test instruments for other techniques in Taekwondo. I hope that someone can again develop this test instrument with the same techniques but on different subjects or female senior Kyourugi athletes.

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