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The Effect of Training Methods and Agility on Reaction Speed Of Por and PKO FIKKM UNIMA Students

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Abstract. *This research is an experimental research withThe research design used in this study is "Treatment by blocks design 2 x 2", or treatment of a 2 x 2 factorial experimental research design. The population in this study was 66 students from the POR and PKO FIKKM UNIMA departments. The sample was 40 students based on calculations using the Slovin formula, while the sampling technique used was Simple Random Sampling. Data collection for the agility test on March 25, 2024 and continued with the Results Test on May 7, 2024. Where the treatment was given 16 times, with a frequency of 3 times a week. The data analysis technique used was ANOVA with a significance level of 5%. The results of the study showed that: 1). There is a significant difference in the effect between SSD training and SRBD training on reaction speedon POR and PKO FIKKM UNIMA students, where Fo = 5.69 is greater than Ft = 4.11;. 2.) There is a difference in the influence of SSD and SRBD training methods on POR and PKO FIKKM UNIMA students who have high agility, where Qh = 5.97 is greater than Qt = 3.79.;3.) There is no difference in the influence of SSD and SRBD training methods on POR and PKO FIKKM UNIMA students who have low agility, where Qh = 1.56 is smaller than Qt = 3.79.;4.) Interaction between SSD and SRBD training methods of agility training types (high and low) on the reaction speed of POR and PKO FIKKM UNIMA students, whereobtained an average score of the SSD training method group that has high agility of 51.15 and an average score of the SSD training method group that has low agility of 42.9. With an average score of the SRBD training method group that has high agility of 44.85, and an average score of the SRBD training method group that has low agility of 44.55.*

Keywords: *Experimental, Design, Agility, Sampling*

1. INTRODUCTION

Sports have become part of various aspects of life ranging from culture, economy, to education. In the world of education, especially in Indonesia, sports are included in the curriculum in the subject of Physical Education, Sports, and Health (PJOK) starting from Elementary School, Junior High School, and High School-Equivalent. At the College or University level, sports themselves are included in the university curriculum which is divided into Athletics, Gymnastics, Games, Aquatics, and Martial Arts. Such as the curriculum at one of the leading universities in North Sulawesi province, namely Manado State University (UNIMA), at the Faculty of Sports Science and Public Health (FIKKM), in the Department of Sports Education (POR) and the Department of Sports Coaching Education (PKO).

According to Mahapatra, C. and Abhinandan, A. (2023, 28(1)) said that "reaction speed as reaction time which means" the time between the provision of stimulation (stimulus) and the first movement ". While Sadasivam, DC, Hara, H, and Manoharlal (2023) said "reaction or reaction is a person's ability to act immediately, in response to

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stimuli that come through the senses, nerves or other feelings". Thus, reaction speed is a person's ability to respond to stimuli in the form of initial movements when receiving external stimuli that come through the senses, nerves or other feelings in the same form with the shortest possible time. Speed of movement is the most important ability in competitive sports. Almost all results are determined by this ability, whether it is a type of game sport, martial arts, cyclical sports, or even accuracy sports. Because the majority of athletes are required to run, move, react, or change direction quickly.

There are many training methods to increase reaction speed, one of which is the Side Shuffle Drill (SSD) training method and the Shuffle Reaction Ball Drill (SRBD) training method. Both of these training methods, namely the SSD and SRBD training methods, were developed by Jay Dawes (2020). The side shuffle drill training method is an exercise that is useful for increasing the response to stimuli by using visual stimuli and step speed for athletes who are lacking in reaction. Brown, Lee.E (2021) Side Shuffle drill is a popular agility exercise used among players of all fitness levels. It is considered an agility exercise that helps develop coordination, agility, balance, and speed.

Jay Dawes (2020) expressed his opinion to do the exercise, the body position from a standing position with the feet hip-width apart, open the legs shoulder-width apart and the body goes down to a half-squat position. While maintaining the half-squat position, move by taking short steps shoulder-width apart according to the instructions directed by the coach. Robert.G.Lockie (2019) with side shuffle drill can help athletes move actively and rotate quickly on the field.

This required shift in direction greatly improves the player’s performance during the game. It also allows for quick regaining of balance after an unexpected move. The player will move instantly and reactively referring to quick response. Doing side shuffle drills has many benefits for improving balance, agility, coordination, speed and response time.

*Shuffle reaction ball drill*is an exercise to improve reaction time and agility skills by using a stimulus about the sense of seeing response (Jay Dawes, 2020). In general, the purpose of the shuffle reaction ball drill training method is to improve reaction movements to incoming stimuli as well as agility and coordination using visual stimuli or the sense of seeing response.

From the problems expressed by the researcher above,So the researcher intends to solve this problem by conducting research with the title "The Influence of Training Methods and Agility on Reaction Speed in POR and PKO FIKKM UNIMA Students.

2. METHODS

The method used in this study is an experiment involving independent variables, control variables and dependent variables. The following is an explanation of the three variables:

The variables used in this study are as follows:

a. The independent variables in this study are divided into 2, namely:
   1) Active Independent Variables, namely: SSD and SRBD training methods,
   2) Attributive variables are: high agility and low agility.

b. The dependent variable in this study is reaction speed.

The research design used in this study is "Treatment by blokcs design 2 x 2" (Statistics and Applications 2020), or a 2 x 2 factorial experimental research design treatment, as shown in the following table.

Table 1. Treatment research design by blokcs design 2 x 2

Agility (B) Training Method Agility (b) Speed Training Method Reaction (A)	Training Method Side Shuffke Drill (SSD) (A1)	Training Method Shuffke Reaction Ball Drill (SRBD) (A2)
High Agility (B1)	A1B1	A2B1
Low Agility (B2)	A1B2	A2B2

Information :

A1B1: SSD training method group that has high agility.

A2B1: SRBD training method group that has high agility.

A1B2: SSD training method group that has low agility.

A2B2: SRBD training method group that has low agility.

The division of the experimental group was based on the agility test. After that, the results of the agility test were ranked (sorted from high to low), samples with equivalent abilities were paired into 2 groups, namely the SSD training method group and the SRBD training method group. Thus, the two groups before being given treatment had become balanced groups.

The place where this research was conducted was in the POR Department Room; PKO Department Room; UNIMA Stadium; Outdoor volleyball court and in the FIKKM Gymnastics/Table Tennis Building and the FIKKM Sports Building/GOR, Manado State University in Tondano. The research was conducted for 2 months, from March 25, 2024 to

May 7, 2024. The population in this study wasPOR and PKO FIKKM UNIMA studentswith a total of 66 students.

The sample used in this study was 66students majoring in POR and PKOwhich is then divided by the sample calculation using the Slovin formula. With the following calculation: $n = \frac{N}{1+Ne^2} n = 39{,}75$rounded up to 40.

3. RESULTS AND DISCUSSIONS

Research Result Data

The data from this study are in the form of data results which are a general description of each variable related to the study. This study was conducted at FIKKM UNIMA for POR and PKO students. Data collection began on March 25, 2024 for the agility test and May 7, 2024 for the data results. Where the provision of*treatment*held 16 times, with a frequency of 3 meetings in 1 week. The following is a table and image of the results of the Reaction Speed data on POR and PKO FIKKM UNIMA students.

Table 2. Results of calculating the X and SD values of the study

AGILITY (B)	**TRAINING METHOD (A)**	
	SSD (A1)	**SRBD (A2)**
TALL (B1)	n = 10	n = 10
	ΣX = 511.5	ΣX = 448.5
	ΣX^2 = 261632.25	ΣX^2 = 201152.25
	$\bar{X}$ = 51.15	$\bar{X}$ = 44.85
	SD = 3.19	SD = 6.62
LOW (B2)	n = 10	n = 10
	ΣX = 429	ΣX = 445.5
	ΣX^2 = 184041	ΣX^2 = 198470.25
	$\bar{X}$ = 42.9	$\bar{X}$ = 44.55
	SD = 7.61	SD = 6.90
TOTAL	n = 20	n = 20
	ΣX = 940.5	ΣX = 894
	ΣX^2 = 178895	ΣX^2 = 160590
	$\bar{X}$ = 94.05	$\bar{X}$ = 89.4
	SD = 10.23	SD = 6.25

The following is a diagram of the data resulting from the calculation of X and SD of the research.

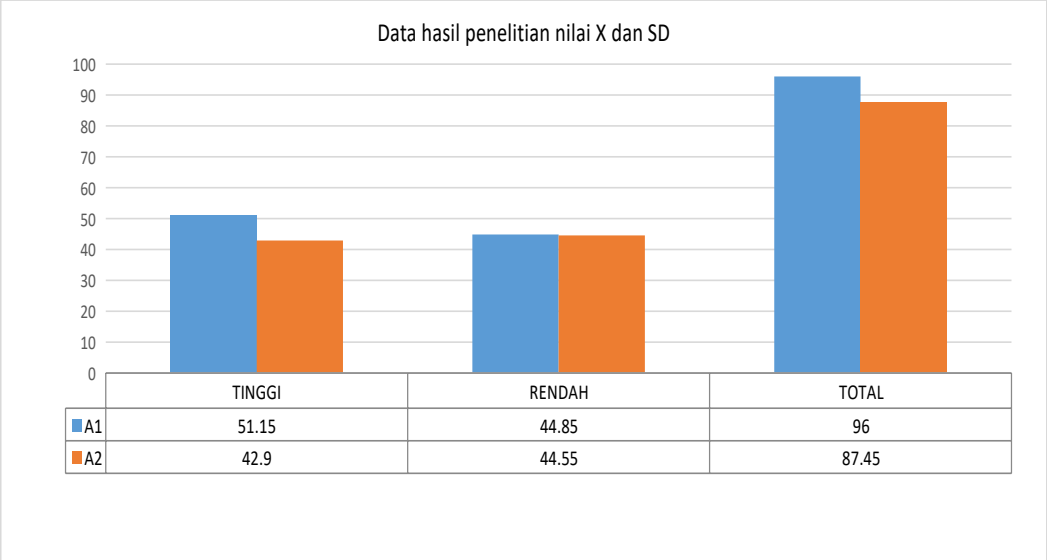

Figure 1. Data diagram of the results of the X and SD calculations for the study

2 Data Analysis Test

a. Normality Test

The data normality test in this study used the test method*Lilliefors*. The results of the data normality test carried out on each analysis group were carried out at a significant level.α = 0.05. by seeing whether the data obtained from each research variable is normal or not. Then the test is carried out through the results of the highest L̨hitung (Lh) score from the group studied which is smaller than the Ltabel (Lt) score in the list or ([F(zi)-S(zi)]), so that the data is said to be normally distributed. The complete results are presented as follows:

Table 3. Normality Test Results

GROUP	n	Lh	Lt	INFORMATION
SSD OVERALL	20	0.142	0.190	NORMAL
OVERALL SRBD	20	0.155	0.190	NORMAL
A1B1	10	0.201	0.258	NORMAL
A2B2	10	0.173	0.258	NORMAL
A1B2	10	0.236	0.258	NORMAL
A2B2	10	0.148	0.258	NORMAL

Information :

SSD OVERALL: SSD training method group as a whole

SRBD OVERALL: The SRBD training method group as a whole

A1B1: Groups of students with high agility are trained using the SSD training method.

A2B1: Groups of students with high agility are trained using the SRBD training method.

A1B1: Groups of students with low agility are trained using the SSD training method.

A2B2: Groups of students with low agility were trained using the SRBD training method.

Based on the table above with the results of the Liliefors Calculation score (Lh) on all data groups, the results are smaller than the Liliefors Table score (Lt). Thus, it can be concluded that the research sample is normally distributed.

b. Homogeneity Test

The homogeneity test is carried out to test the equality of several samples, namely whether they are homogeneous or not. This test uses the Bartlett test at a significant level.α = 0.05. Complete calculation of homogeneity test can be seen in appendix 4. The following is a table of the results of the calculation of homogeneity test in each group.

Table 4. Summary of Homogeneity Test Calculation Results

Group	Variance (S^2)	Combined Variance	X^2 count	X^2 table	Conclusion
A1B1	10,233	37.83	6.53	7.81	Homogeneous
A2B1	34.67	37.83	6.53	7.81	Homogeneous
A1B2	59,289	37.83	6.53	7.81	Homogeneous
A2B2	47,122	37.83	6.53	7.81	Homogeneous

Information :

A1B1: Group of students with high agility who are trained using the SSD training method.

A2B1: Group of students with high agility who are trained using the SRBD training method.

A1B1: Group of students with low agility who were trained using the SSD training method.

A2B2: Groups of students with low agility were trained using the SRBD training method.

The test results provide an indication that the valueX^2 count = 6.53 is smaller compared toX^2 table = 7.81, so it can be concluded that the four groups of data tested come from a homogeneous variance population.

c. Hypothesis Testing

With the testing of normality and homogeneity of the research data. So the requirements for ANOVA analysis have been met. The testing of the research hypothesis is carried out based on the results of data analysis and interpretation of

ANOVA analysis. The following is a summary of the table of results of the 2x2 ANOVA calculation.

Table 5. Summary of 2x2 ANOVA Calculation Results

Variance	Dk	Jk	Kt	Fo	Ft
Average treatment	1	336539.03			
A (SSD and SRBD Training Method)	1	216.22	216.22	5.69*	4.11
B (High and Low Agility)	1	731,025	731.03	19.25*	4.11
AB (Interaction)	1	632.02	632.02	16.65*	4.11
Experimental Fallacy	1	1366.7	37,9639		
Total		339485			

Information :

'*': Significant at the level $\alpha = 0.05$.

Dk: Degrees of Freedom

Jk: Sum of Squares

Kt: Mean sum of squares

Fo: Observation F score

Ft: Table F score

1) **There are differences in the influence of SSD and SRBD training methods on reaction speed.to POR and PKO FIKKM UNIMA students.**

From the results of the Anova test in the table above, it can be seen that the Fo score = 5.69 is greater than Ft = 4.11, which means Ho is rejected and Hi is accepted. This shows that there is a significant difference in the influence of the SSD training method and the SRBD training method on the reaction speed of POR and PKO FIKKM UNIMA students. Based on the results of the analysis, the SRBD training method produces higher results when compared to the SSD training method.

In other words, the results of the SRBD training method (X=90.05 and SD=10.23) are better than the results of the SSD training method (X=89.45 and SD=6.19). This means that the research hypothesis states that 'The existence of pThe difference in the influence of SSD and SRBD training methods on reaction speed in POR and PKO FIKKM UNIMA students has been proven true.

2) **There are differences in the influence of SSD and SRBD training methods on studentsPOR and PKO FIKKM UNIMA,who has high agility.**

The calculation of advanced stage variance analysis using the Tukey test to determine the differences in the influence of the SSD and SRBD training methods

on POR and PKO FIKKM UNIMA students who have high agility can be seen in the following table:

Table 6. Results of the reaction speed of students who have High Agility

The groups being compared	Q count	Q table	Information
SSD and SRBD with High Agility	5.97	3.79	Significant

The calculation result with Tukey test obtained Qcount score = 5.97 which is greater than Qtable value = 3.79, for significance level α = 0.05. Thus Ho is rejected and Hi is accepted. This means that the research hypothesis stating 'There is a difference in the influence of reaction speed of students who have high agility on the reaction speed of POR and PKO FIKKM UNIMA students', has been proven true.

3) There are differences in the influence of SSD and SRBD training methods on studentsPOR and PKO FIKKM UNIMAwho have low agility.

The calculation of advanced stage variance analysis using the Tukey test to determine the differences in the influence of the SSD and SRBD training methods on POR and PKO FIKKM UNIMA students who have low agility can be seen in the following table:

Table 7. Results of the reaction speed of students who havelow agility

The groups being compared	Q count	Q table	Information
SSD and SRBD which have Low Agility	1.56	3.79	Significant

The calculation result with Tukey test obtained Qcount score = 1.56 smaller than Qtable value = 1.56, for significance level α = 0.05. Thus Ho is accepted and Hi is rejected. This means that the research hypothesis states: There is no difference in the effect of reaction speed of students who have low agility on the reaction speed of POR and PKO FIKKM UNIMA students.

4) There is an interaction between the SSD and SRBD training methods and agility (high and low) on reaction speed.POR and PKO FIKKM UNIMA students.

The summary of the results of the variance analysis calculations is as in the following table:

Table 8. Interaction between SSD and SRBD training methods

AGILITY (B)	TRAINING METHOD (A)	
	SSD (A1)	SRBD (A2)
TALL (B1)	n = 10	n = 10
	ΣX = 511.5	ΣX = 448.5
	ΣX^2 = 261632.25	ΣX^2 = 201152.25
	$\bar{X}$ = 51.15	$\bar{X}$ = 44.85
	SD = 3.19	SD = 6.62
LOW (B2)	n = 10	n = 10
	ΣX = 429	ΣX = 445.5
	ΣX^2 = 184041	ΣX^2 = 198470.25
	$\bar{X}$ = 42.9	$\bar{X}$ = 44.55
	SD = 7.61	SD = 6.90

The value of Fcount interaction (FAB) = 8.325 and Ftable = 4.11, so Fcount > Ftable. Based on the research data, the average score of the SSD training method group that has high agility is 51.15 and the average score of the SSD training method group that has low agility is 42.9. With the average score of the SRBD training method group that has high agility of 44.85, and the average score of the SRBD training method group that has low agility of 44.55. Thus Ho is rejected and Hi is accepted, in other words there is an interaction between the SSD and SRBD training methods and agility (high and low) on the reaction speed of POR and PKO FIKKM UNIMA students. The following is a diagram of the interaction:

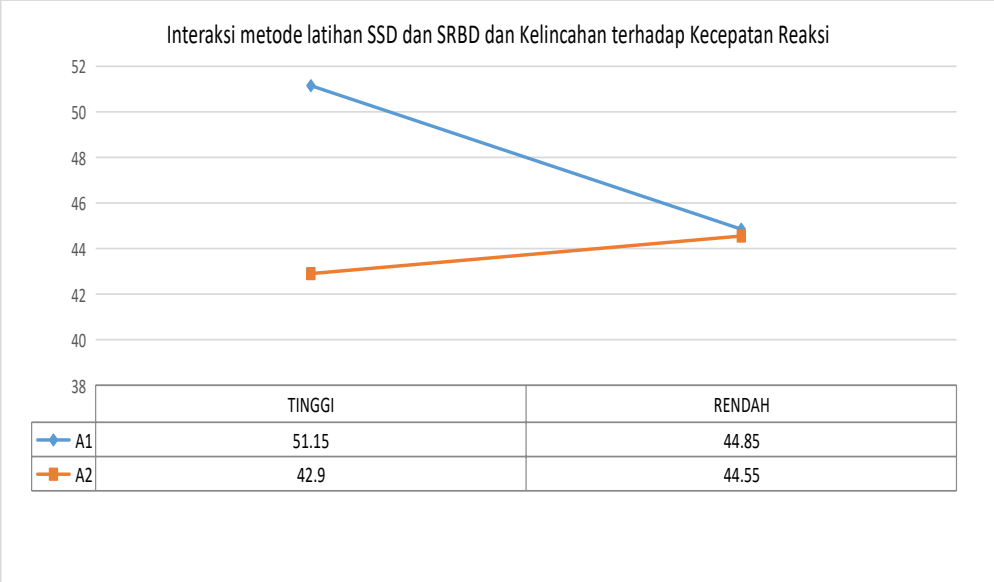

Figure 2. SSD and SRBD Interaction Diagram and Agility on Reaction Speed

4. CONCLUSION

The conclusions of this research are as follows:

a. There are differences in the influence of SSD and SRBD training methods on reaction speed.to POR and PKO FIKKM UNIMA students.
b. There are differences in the influence of SSD and SRBD training methods on studentsPOR and PKO FIKKM UNIMAwho has high agility.
c. There is no difference in the influence of SSD and SRBD training methods on studentsPOR and PKO FIKKM UNIMAwho have low agility.
d. There is an interaction between training methods and agility on reaction speed.POR and PKO FIKKM UNIMA students.

From the results of this study it is recommended:

a. There is a need for continued scientific research on SSD training methods.and SRBD training methods,in the game and individual branches which involve elements of the type of sports training, especially regarding reaction speed.
b. Based on the results of this study, it is proven that the SRBD method is the most effective method used for players with high agility and the SSD method is more effective for players with low agility. This is a study that can be used by researchers in the field of sports in innovating to improve reaction speed training methods. For researchers who intend to continue this research, it is advisable to carry out tighter control in the entire series of experiments. This control is carried out to avoid threats from external and internal interference during the study.

REFERENCES

Abusaleh, K. M. (2009). The effect of volleyball training program on the reaction time. *Scientific Journal of King Faisal University, 10*.

Ahmadi, N. (2007). *Volleyball sports guide*. Solo: Main Library Era.

Aji, S. (2016). *The most complete sports book*. Pamulang: Ilmu Alfabeta.

Alfabeta. (2014). *Qualitative quantitative research methods and R&D*. Bandung.

Apta Mylsidayu, & Kurniawan, F. (2021). *Basic coaching science*. Alfabeta.

Arnett, J. E., Addie, C. D., Cosio-Lima, L. M., & Brown, L. E. (2021). Ground reaction force comparison between barefoot and shod single leg landing at varied heights. *International Journal of Kinesiology and Sports Science, 9*(4).

Barcelos, J. L., Morales, A. P., Marciel, R. N., Azevedo, M. M. A., & Silva, V. F. (2009). A comparative study of the motor reaction time among volleyball players. *Journal of Fitness and Performance*.

Bogus, V., Getmantsev, S., Sokol, O., Reznichenko, O., Kuvaldina, O., & Yatsunskiy, Y. (2015). Perfection of the special preparation of volleyball players. *Slobozhanskyi Herald of Science and Sport*.

Bompa, T. O., & Haff, G. G. (2009). *Periodization theory and methodology of training*. New York University & West Virginia University: Human Kinetics.

Dawes, J., & Roozen, M. (2020). *Developing agility and quickness*. Champaign, IL: Human Kinetics Publishers.

Djoko Pekik Irianto, et al. (2023). Learning to improve cognitive ability, fighting power and sportsmanship in college students. *PGRI Nusantara Program, Kediri University*.

Ekah, U. J., & Iloke, J. (2022). Performance evaluation of key performance indicators for UMTS networks in Calabar, Nigeria. *GSC Advanced Research and Reviews*, *10*(1), 47–52.

Ezenwakwelu, C. A., Akpan, E. E., & Ogbogu-Asogwa, O. I. (2021). Enabling service innovation through dynamic capabilities: Insight from telecommunication firms. *International Journal of Business and Management Invention, 10*(5), 54–63.

Faculty of Mathematics and Natural Sciences, UNY. (2002). *Coaching basics* (a dictation). Yogyakarta.

Faculty of Physical Education and Health (FPOK), UPI. (2007). *Sports education tests and measurements*. Bandung: FPOK UPI.

Fincham, J. (2008). Response rates and responsiveness for surveys, standards, and the journal. *American Journal of Pharmaceutical Education, 72*(2), Article 43.

Komlimechkov, S., Petrov, L., & Alexandrova, A. (2019). Gymnastics science: Physical fitness norms—4x10 shuttle run test.

Kurdi, R. Q., & Rifiy, K. Q. (2020). The relationship between hand reaction speed and eye coordination. *Jtikor (Journal of Applied Sports Science)*.

Lockie, R. G., Dawes, J. J., & Callaghan, S. J. (2020). Lower-body power, linear speed, and change-of-direction speed in Division I collegiate women's volleyball players. *Biology of Sport, 37*(4), 423–428.

Mahapatra, C., & Abhinandan, A. (2023). Correlation between speed and agility with an influence of gender in adolescent Kho-Kho players—An observational study. *Bulletin of Faculty of Physical Therapy, 28*(1). https://doi.org/10.1186/s43161-023-00148-5

Moh. Hanafi, Brahmana, R. P., & Gatot, M. U. (2019). *Sports coaching methodology: Stages and preparation of training programs*. CV. Jakad Media Publishing.

Orr, R., Sakurai, T., Scott, J., Movshovich, J., Dawes, J. J., Lockie, R., & Schram, B. (2021). The use of fitness testing to predict occupational performance in tactical personnel: A critical review. *International Journal of Environmental Research and Public Health*, *18*(14), 7480.

Sadasivam, D. C., Hara, H., & Manoharlal, M. A. (2023). Effect of agility drills along with reaction time exercises on agility and reaction speed among collegiate badminton players.

Sapam, S., Singh, K. K., & Sinha, B. K. (2020–2021). Randomized block designs, balanced incomplete block designs, and Latin square designs with neighbor effects in the presence of covariates. *Statistics and Applications (New Series)*, *19*(1).

Wiriawan, O. (2017). *Guidelines for implementing athlete tests and measurements*. Thema Publishing Team.