

Analysis of Physical Fitness Profile of Athletes with Intellectual Disability in Special Olympics Indonesia (SOIna) after the Covid-19 Pandemic

Slamet Sukriadi^{1*}, Yasep Setiakarnawijaya¹, James Tangkudung¹, Firmansyah Dlis¹, Dicky Reva Apriana Sanga Dwi², Muhamad Arif¹, Bazuri Fadillah¹, Mustara¹, Nur Fitranto¹, Ikhwan Setiawan¹

¹Department of Physical Education, Faculty of Sport Science, Universitas Negeri Jakarta, Indonesia

²Department of Physical Education, STKIP Muhammadiyah Kuningan, Indonesia

Received February 22, 2023; Revised April 18, 2023; Accepted May 17, 2023

Cite This Paper in the Following Citation Styles

(a): [1] Slamet Sukriadi, Yasep Setiakarnawijaya, James Tangkudung, Firmansyah Dlis, Dicky Reva Apriana Sanga Dwi, Muhamad Arif, Bazuri Fadillah, Mustara, Nur Fitranto, Ikhwan Setiawan, "Analysis of Physical Fitness Profile of Athletes with Intellectual Disability in Special Olympics Indonesia (SOIna) after the Covid-19 Pandemic," *International Journal of Human Movement and Sports Sciences*, Vol. 11, No. 5, pp. 1044 - 1059, 2023. DOI: 10.13189/saj.2023.110513.

(b): Slamet Sukriadi, Yasep Setiakarnawijaya, James Tangkudung, Firmansyah Dlis, Dicky Reva Apriana Sanga Dwi, Muhamad Arif, Bazuri Fadillah, Mustara, Nur Fitranto, Ikhwan Setiawan (2023). *Analysis of Physical Fitness Profile of Athletes with Intellectual Disability in Special Olympics Indonesia (SOIna) after the Covid-19 Pandemic*. *International Journal of Human Movement and Sports Sciences*, 11(5), 1044 - 1059. DOI: 10.13189/saj.2023.110513.

Copyright©2023 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract Special Olympics Indonesia or SOIna is the only organization in Indonesia that is accredited by Special Olympics International (SOI) to organize training and sports competitions for mentally retarded citizens in Indonesia. Indonesia became a member of the 79th Special Olympics on August 9, 1989. The main program of SOIna is training and sports competitions throughout the year. There are 7 sports that are fostered, namely Athletics, Badminton, Table Tennis, Football, Basketball, Swimming, and Bocce. SOIna also held multi-level sports competitions starting from the Regency, Provincial, Regional, and National Levels. Experts in this study were recruited to conduct analysis on SOIna athletes, namely an analysis of strengths, weaknesses, opportunities, and threats (SWOT) to determine their fitness profile. After analyzing the SWOT, it is hoped that it will be taken into consideration by the head coach or physical trainer to analyze the lack of training or good methods for the condition of mentally retarded athletes, especially after the Covid-19 pandemic, they rarely exercise, so that it can affect the child's health or mentality. The data collection technique in this study was to perform a physical condition ability test. This test was conducted on Athletes with Intellectual Disabilities who were sampled in this study, namely tests for measuring, Anthropometry and Body Mass Index and Biomotor Test: (1) Speed; (2) Arm Muscle Strength; (3) Limb Muscle Strength; (4) Abdominal Muscle Endurance; (5) Arm

Muscle Endurance and (6) Aerobic Endurance. The material for measurement is the physiology laboratory at the State University of Jakarta, such as using a dynamometer for the core balance test and the VO₂ max test using the Rockport method, this test is used as a calculation and analysis for athletes with intellectual disability.

Keywords SOIna, Fitness Profile, SWOT Analysis

1. Introduction

Many people with disabilities are motivated by health problems, and their disability can also affect their health. The health sector plays a role in prevention and rehabilitation efforts and in healthcare efforts. People with disabilities also need to receive professional and affordable services that meet their specific needs. Intellectual disability is a condition characterized by intellectual limitations, adaptive behavior, and social limitations that appear before the age of 18 years [1]. The causes of intellectual disability are divided into two, namely internal and external. Internal factors include heredity or biological factors, namely chromosomal disorders, and genetic disorders. While external factors

include maternal malnutrition, poisoning, radiation, brain damage during birth due to premature birth or low birth weight, excessive heat, infection in parents, brain or physiological disorders [2]

Other factors that cause intellectual disability are psychological and social factors, namely a non-conducive environment that can affect intelligence, and a poor environment and low family social status can cause children to have intellectual limitations due to a poor environment and lack of stimulation and responsiveness to children's intellectual development. Children with intellectual disability are the most common category of children with developmental disorders.

According to WHO data, children with intellectual disabilities make up about 1-3% of the general population of children [3]. Children with intellectual disabilities are characterized by several symptoms, namely developmental deficits in the state of the intellectual and socially adaptive domains, conceptually and practically that occur before the age of 18 years. Disability is a complex multidimensional social construct. In a sporting context, people with a disability often face a multitude of barriers to participation in sport and achievement in sport [4].

Cognitive functions are determined by intelligence tests and adaptive abilities refer to the conceptual, social, and practical abilities that a person learns to function in everyday life [5]. Determination of intellectual limitations is determined based on an IQ score (intelligent quotient) which is determined by a standardized intelligence test such as the Weschler scale or the Stanford Binet Intelligence Scale. Intellectual functions include the ability to provide reasons to solve planning problems and think abstractly, while adaptive functions such as the ability in terms of independence and social responsibility [2].

Children with intellectual disabilities can also be developed based on their characteristics and limitations and what can be developed in their daily lives. The subject in this case was diagnosed with moderate intellectual disability with characteristics of IQ 51, limitations in adaptive and social functions. The characteristics of children with moderate intellectual disabilities are that they are able to be trained, even though they respond long to education and training, children can be trained to take care of themselves. In addition, children with intellectual disabilities have deficiencies in the ability to remember and generalize language, conceptual, perceptual and creativity so that they need to be given simple and short, relevant tasks [6].

The classification of intellectual disability is adjusted according to several fields of science, some are based on etiology, based on ability, or based on clinical characteristics. The American Association of Mentally Deficiency (2010) classifies intellectual disabilities into 4, namely mild intellectual disability (able to be educated) with an IQ of 50-70, moderate intellectual disability

(ability to train) with an IQ of 35-50, severe intellectual disability with an IQ of 20-35 and very heavy with an IQ below 20.

Classification based on the intellectual level affects physical fitness. Research on physical fitness in children and adolescents with intellectual disabilities has been widely carried out for children and adolescents with mild to moderate intellectual disabilities. Children and adolescents in the category of severe intellectual disability were not well represented in the study [7]. This is because the low cognitive ability of children with intellectual disabilities causes children to find it difficult to understand instructions or carry out tests which makes the implementation of the test not optimal and the test results become invalid [8]. In addition, children's low motivation when carrying out tests and short attention spans also affect the results of physical fitness tests carried out.

Physical fitness is one of the most important assets that a person must have. The statements above show that physical fitness is very important for everyone to carry out daily activities. Physical fitness is the ability to do physical work at a certain level without excessive fatigue.

The Part components of physical fitness consist of several elements, including: (1) Strength, (2) endurance, (3) explosive power, (4) flexibility, (5) speed, (6) agility, (7) coordination, (8) balance, (9) accuracy, (10) reaction time [9].

Physical fitness is the need that we must meet in order to successfully perform the activities of everyday life. Another definition, physical fitness is the body's ability to perform an activity without feeling undue fatigue. The term fitness has the same meaning as total fitness, the so-called physical aspect of fitness. In general, the term physical fitness is the ability of a person to perform the activities of daily living with ease and effort, without experiencing significant fatigue, and to have stored energy for other activities. A set of qualities possessed by Physical fitness can be defined as "the ability to perform daily tasks with vigor and alertness, to enjoy leisure and to cope with unforeseen emergencies, without appreciable fatigue, and with sufficient energy" [10].

The higher the physical strength of a person, the higher his physical capacity to work. Physical fitness is the key to true health and endurance. Therefore, some people regularly engage in a variety of exercises and physical activities, such as: B. Sports. Your body will become stronger and you will be less likely to get sick. In addition to a stable state of health, physical training can give you a fresher physical sensation. Therefore, the more you move, the less you get tired, and you can increase your endurance through physical training [11].

Special Olympics is a global movement that empowers people with intellectual disabilities through training and sports competitions. Special Olympics because of its specialty, has been recognized by the International Olympics Committee (IOC) as the only special sports organization for the mentally retarded [12].

Special Olympics Indonesia or SOIna is the only organization that is accredited by Special Olympics International (SOI) to organize training and sports competitions for people with mental retardation in Indonesia. Indonesia itself joined as a member of the 79th Special Olympics on August 9, 1989.

SOIna has a license from PPCI with Number VII/TAP-KU/1993 concerning the inauguration of the SOIna organization and on March 28, 1996, KONI (Indonesian National Sports Committee) recognized SOIna as a National Special Sports Institution. In August 2022, Special Olympics DKI Jakarta has carried out various retraining activities with the aim of maintaining health, improving physical fitness and improving sports skills. The SOIna training activities are held regularly every Saturday morning at 06.00 - 08.00 at the Rawamangun Youth Athletic Stadium East Jakarta.

Sports are meaningful and important in the lives of many people, including those with intellectual disabilities (ID). Like other members of society, some individuals with ID play sports for purely recreational reasons, to develop skills and fitness, and to enjoy interacting with other people. For others, the transition from recreational sports to intense training and competition is a natural progression to push personal limits and pursue sporting dreams and goals [13].

The above statement can be concluded that sport is very meaningful and important in the lives of many people, including people with intellectual disabilities. Like other members of society, some intellectually disabled practice sports only for recreation, to improve their skills and fitness, and to have fun with others.

Intellectual disability athletes trained in the Jakarta Province special Olympics coaching program from 2020 to 2022 have stopped due to the COVID-19 pandemic sweeping the world, training is only carried out with joint gymnastics through virtual face-to-face or remote training using media zoom meeting.

To be able to find out the overall fitness level of intellectually disabled athletes, researchers carried out measurements through the Physical Fitness Test which is expected to provide an overview of the physical fitness level of athletes with intellectual disabilities Special Olympics DKI Jakarta.

2. Research Purpose

The purpose of this study was to determine the biomotor abilities of SOIna athletes so that they can improve in the future.

The physical condition status of a person/athlete can be determined by means of an assessment in the form of an ability test. To measure, there are 5 biomotor components namely strength, endurance, speed, flexibility coordination.

In the athletics branch, it is necessary to know the physical condition of athletes from the 5 components

above, there are 3 components, namely:

1. Strength
2. Durability
3. Speed

The following are types of tests for the physical condition of the 3 biomotor components:

2.1. Strength

This test is to determine a person's muscle strength ability. The tests carried out are on the muscles of the arms, legs, abdomen and waist. On the arm muscles, a test is carried out with push-ups, correctly, namely resting on the palms of the hands, the distance between the palms of the hands is shoulder-width apart, and the distance between the feet is straight. The goal is to strengthen the arm muscles, of novice athletes, the duration of push ups is according to their abilities. Meanwhile, experienced athletes are targeted for the number of repetitions. For the leg muscles: to strengthen the leg muscles, a test was carried out with the gazelle jump and triple jump and the length of each jump was measured.

On the abdominal muscles: to strengthen the abdominal muscle, do a test with sit ups. For novice athletes, the duration of sit-ups is according to their ability, while for experienced athletes, there is a target for the number of repetitions. On the lumbar muscles: to strengthen the lumbar muscles, a back-up test is carried out.

2.2. Durability

This test is to determine the ability of the cardio vascular system to manage O_2 in the body which is used during heavy work. This ability is known as the symbol VO_2 max. The test carried out to measure endurance is by doing a rockport walking test. Measurement formula: VO_2 max = [x meters: 15 – 133] x 0.172 + 33.3. Description: unit VO_2 max = ml/kg body weight/minute. X meters = test mileage.

2.3. Speed

This test is to measure a person's speed in moving. The test or standard commonly used is a speed test with a sprint of 30 meters straight track, 1x repetition each.

3. Materials and Methods

3.1. Materials

The material for measurement is the physiology laboratory at the State University of Jakarta, such as using a dynamometer for the core balance test and the VO_2 max test using the Rockport method, this test is used as a calculation and analysis for athletes with intellectual disability.

Table 1. Physical Fitness Profile Athletes Intellectual Disability Special Olympics Indonesia (SOIna)

Statistics												
		Height	Weight	Age	Speed	Push_up	Sit_up	Back	Leg	Strength_Push	Strength_Pull	Rockport
N	Valid	60	60	60	60	60	60	60	60	60	60	60
	Missing	0	0	0	0	0	0	0	0	0	0	0
Mean		162.38	65.05	25.05	4.5175	22.55	12.18	55.45	81.90	13.78	24.27	41.9052
Median		162.50	60.00	22.00	4.3800	22.50	12.00	51.00	82.00	12.00	16.00	41.1700
Std. Deviation		7.932	18.038	8.919	.79584	5.730	5.809	22.376	31.600	6.101	46.563	10.33801
Variance		62.918	325.370	79.540	.633	32.828	33.745	500.692	998.566	37.223	2168.097	106.875
Minimum		150	44	17	2.72	10	0	22	38	2	4	21.43
Maximum		187	160	54	7.89	40	28	105	165	38	285	63.34

3.2. Methods

Toward types of research in this training, the authors used descriptive research methods [14]. The results of descriptive research aim to describe or tell something that is happening as it is in accordance with the facts that occur in the field.

3.3. Population and Sample

The population referred to in this study were taken from all intellectual disabilities of the Special Olympics DKI Jakarta Centers fostered by Rawamangun. The sampling technique used in this research is purposive sampling [14]. So the sample in question is the DKI Jakarta Special Olympics intellectual disability athlete which consists of 30 athletes with the following criteria: (1) Sons and Daughters, (2) Mild Intellectual Disabilities, (3) Age Range 17-19 years, (4) Have practiced face-to-face for at least 8 weeks in 2022.

3.4. Data Collection Technique

The data collection technique in this study was to perform a physical condition ability test. This test was conducted on Athletes with Intellectual Disabilities who were sampled in this study, namely tests for measuring, Anthropometry and Body Mass Index and Biomotor Test: (1) Speed; (2) Arm Muscle Strength; (3). Limb Muscle Strength; (4) Abdominal Muscle Endurance; (5) Arm Muscle Endurance and (6) Aerobic Endurance.

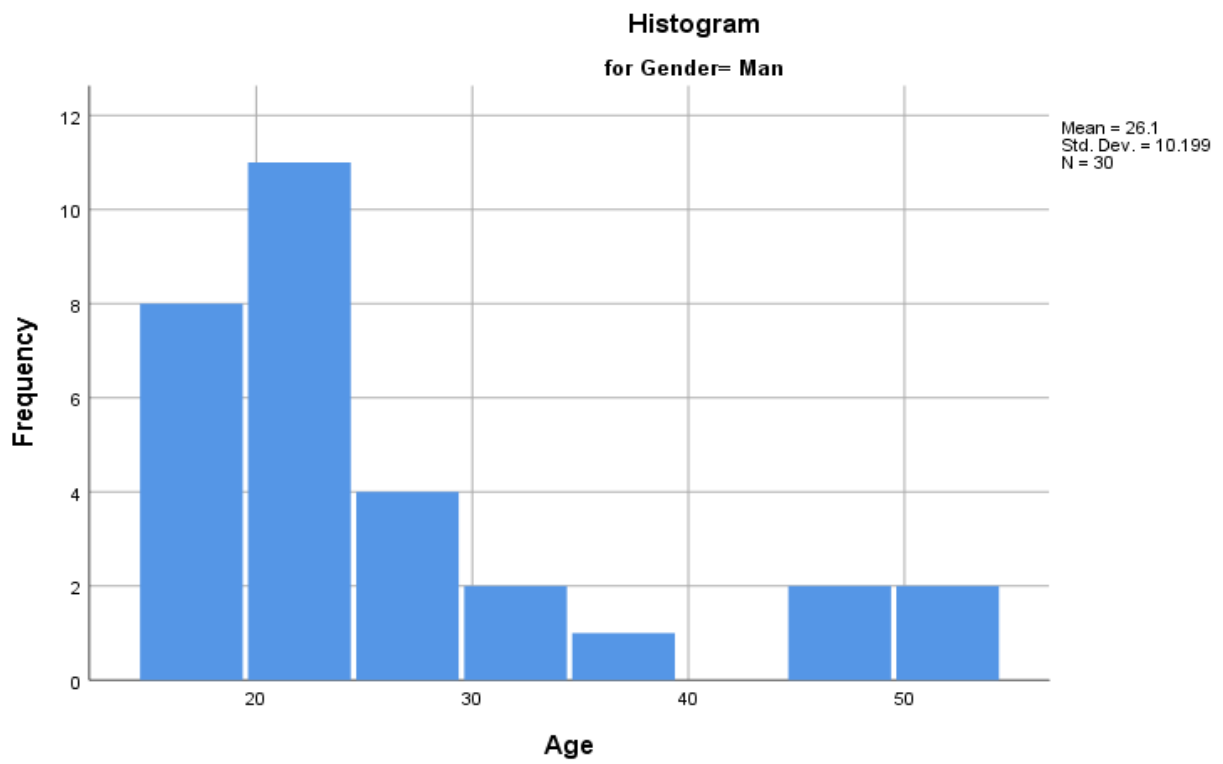
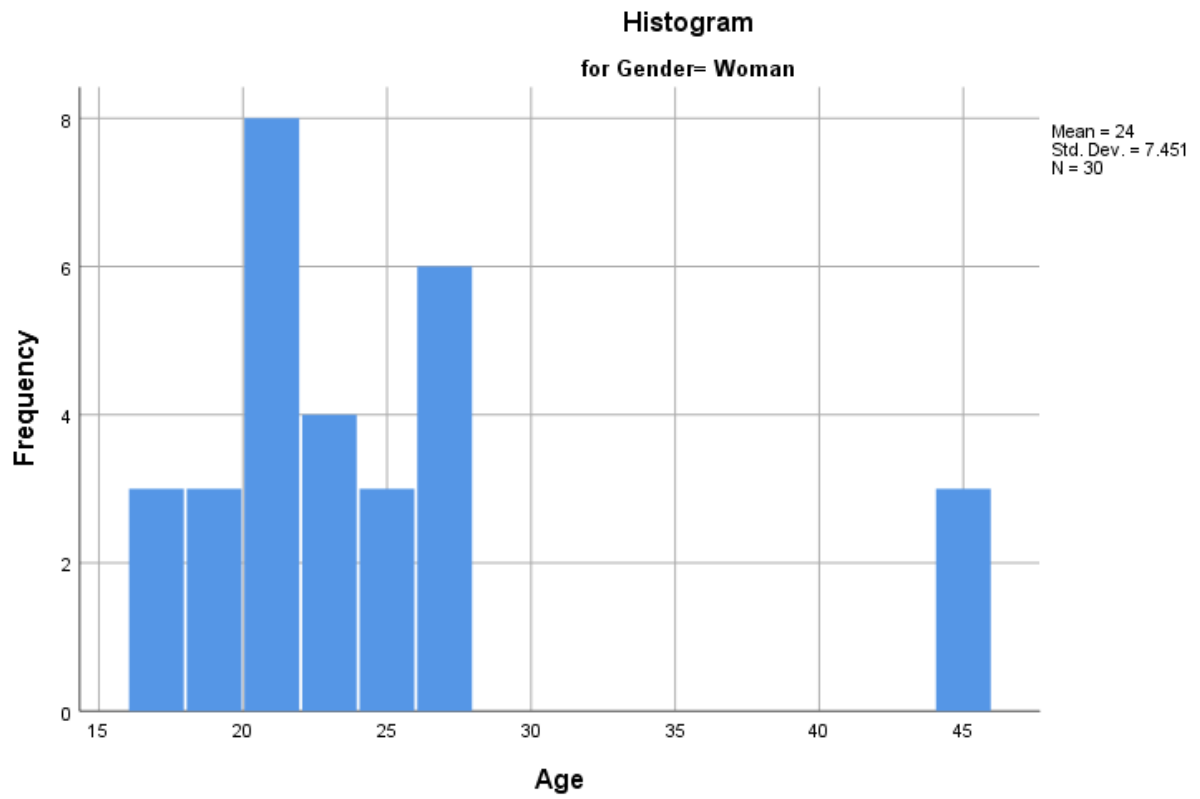
The material for measurement is the physiology laboratory at the State University of Jakarta, such as using a dynamometer for the core balance test and the VO_2 max

test using the Rockport method, this test is used as a calculation and analysis for athletes with intellectual disability.

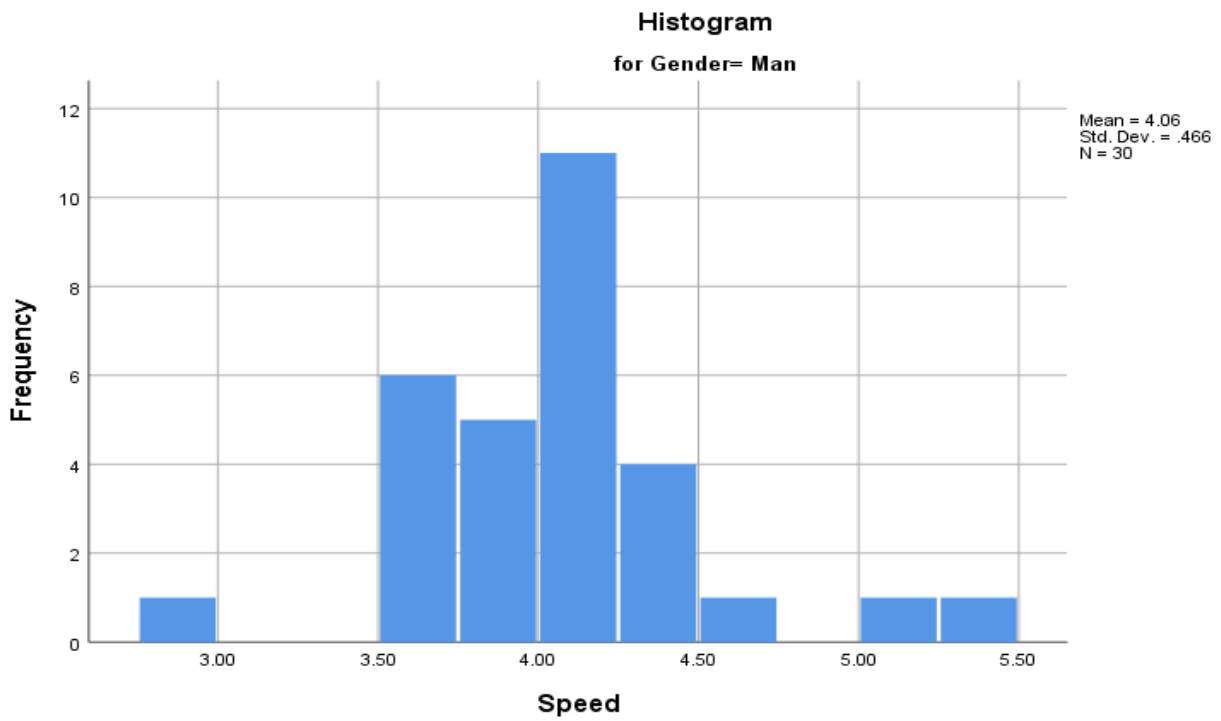
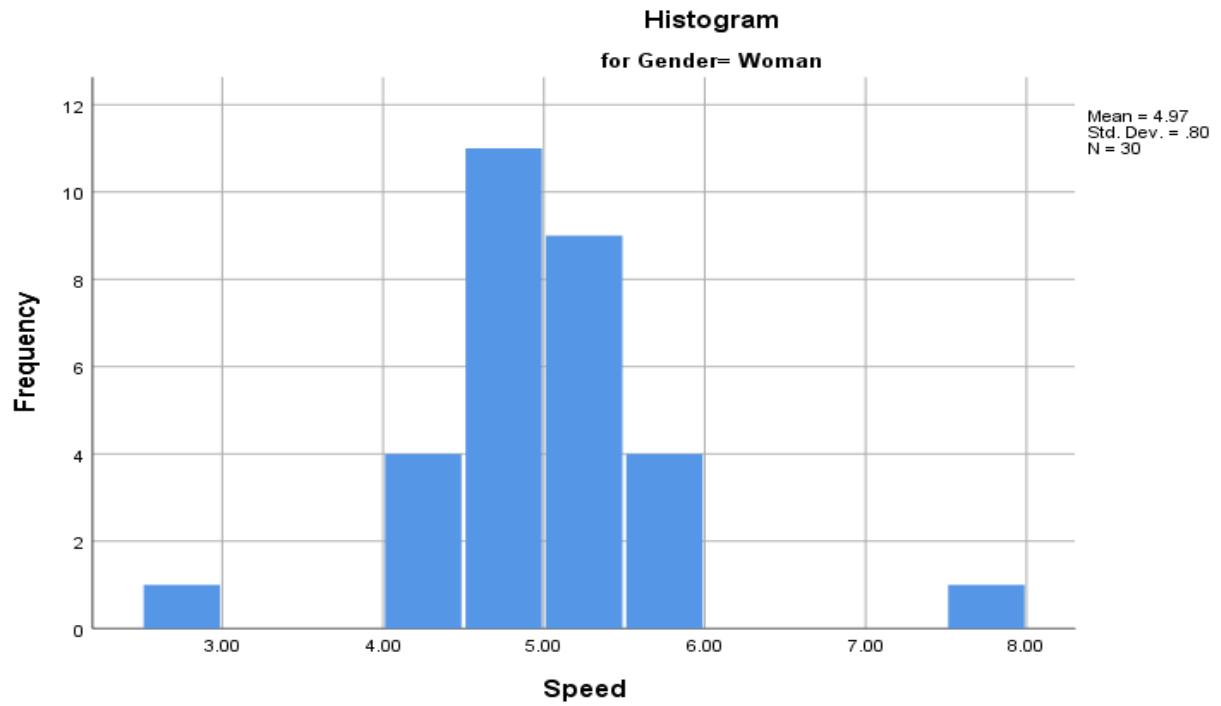
Furthermore, to analyze the results of the fitness of SOIna athletes whose training was disrupted due to the Covid-19 pandemic, a SWOT analysis was carried out consisting of Strengths, Weaknesses, opportunities, and threats. The following is fitness data from SOIna Jakarta athletes.

From the data above, the results obtained by from several test items in the physiology lab, for the Height mean 162.38, Median 162.50, and standard deviation 7.93, Weight mean 65.05 Median 60.00, and standard deviation 18.03, Speed mean 4.51, Median 4.38, and standard deviation 0.79, Push-up mean 22.55, Median 22.50, and standard deviation 5.73, Sit-up mean 12.18, Median 22.50, and standard deviation 5.80. Back mean 55.45, Median 51.00, and standard deviation 22.37, Leg mean 81.90, Median 82.00, and standard deviation 31.60, Strength Push mean 13.78, Median 12.00, and standard deviation 6.10, Strength Pull mean 24.27, Median 16.00, and standard deviation 46.56 VO_2 max fitness test using the Rockport method, the mean is 41.90 the median is 41.17, the standard deviation is 10.338.

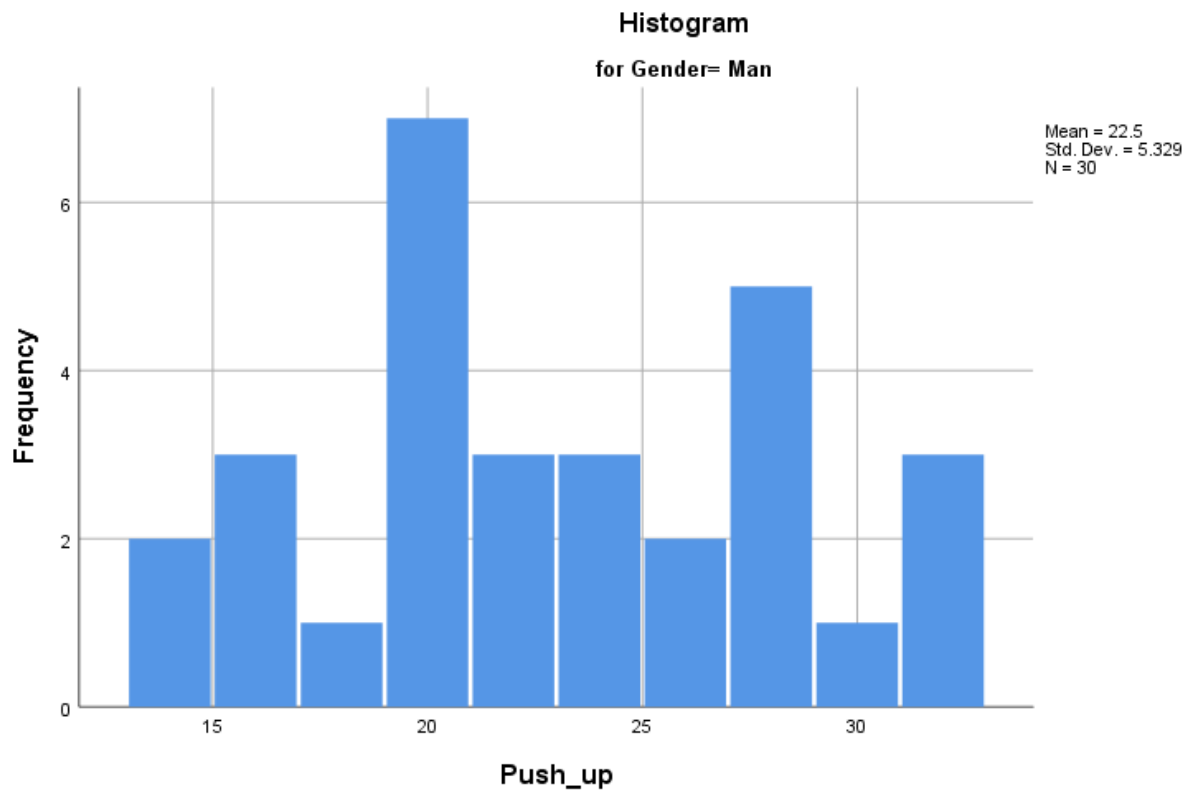
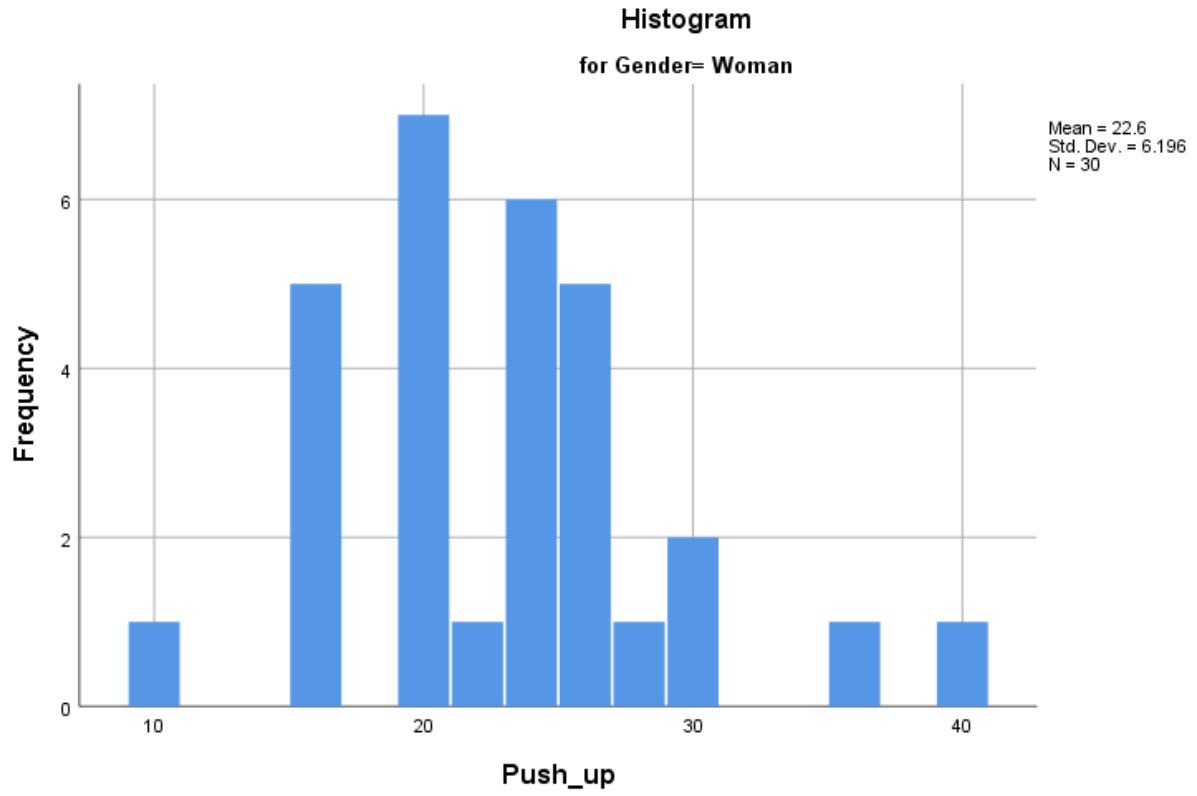
The results of the analysis of the data above, almost most SOIna athletes experience a decrease in fitness or a reduction in biomotor tests due to the influence of the covid-19 pandemic which requires training at home with minimal supervision from training techniques and training programs that are not in accordance with the coach's directions, because athletes only see virtually at zoom media.



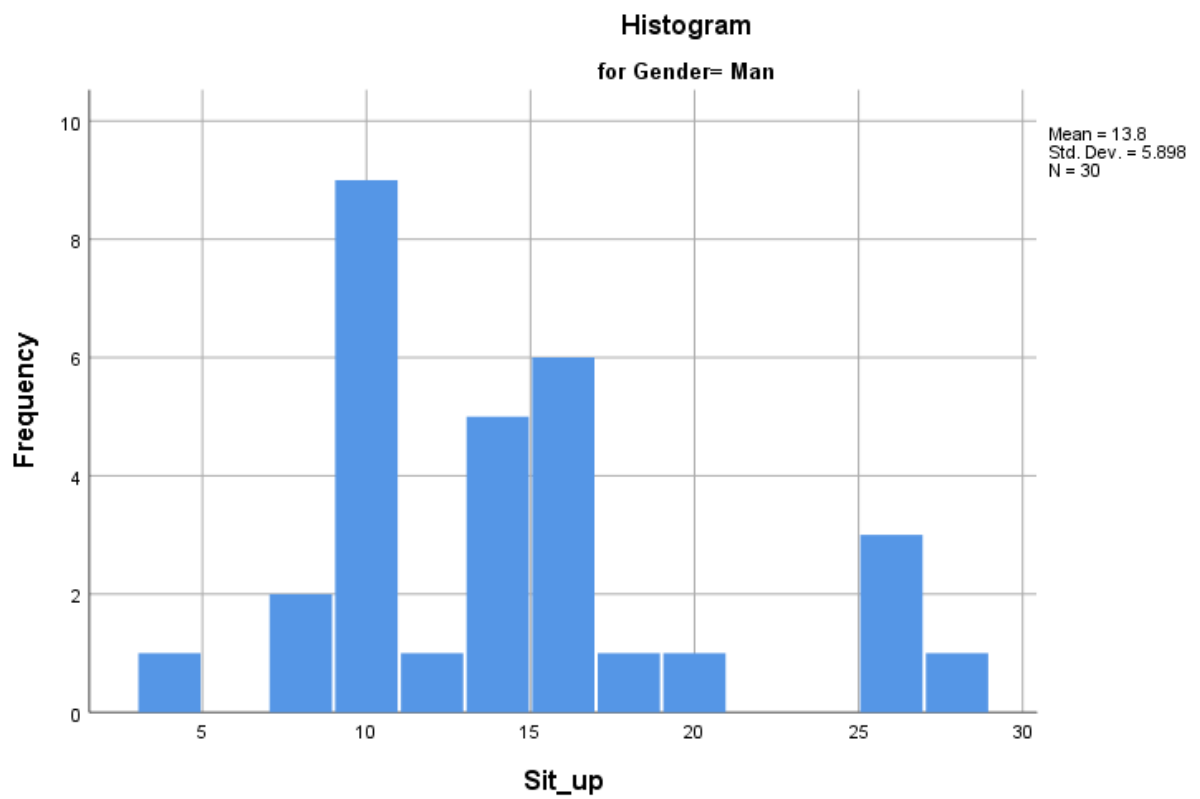
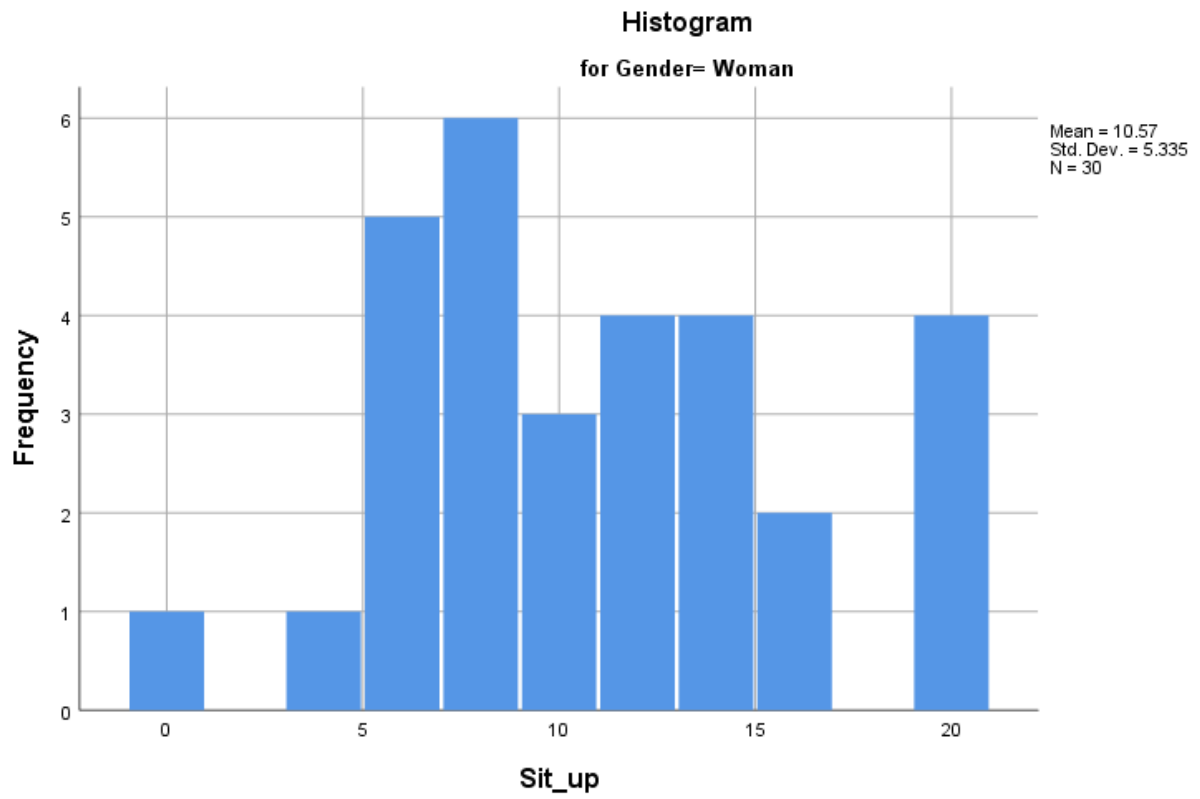
(a) Age Histogram



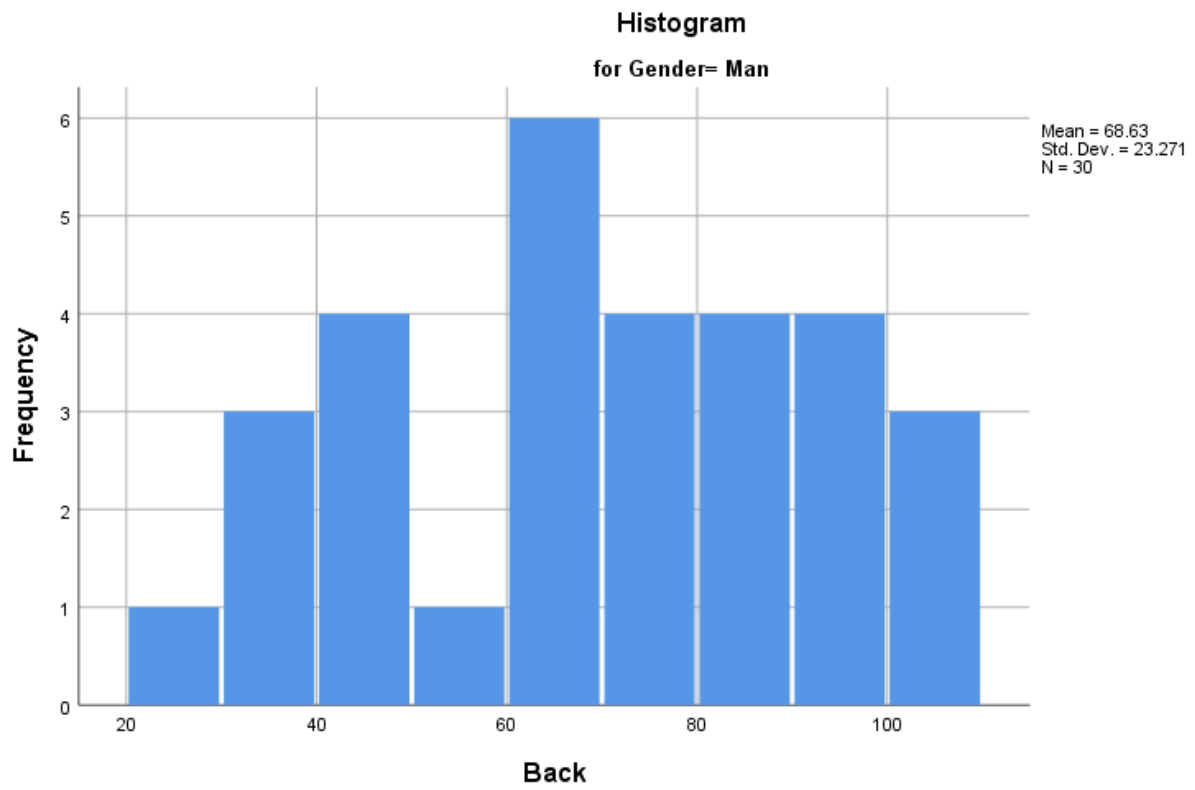
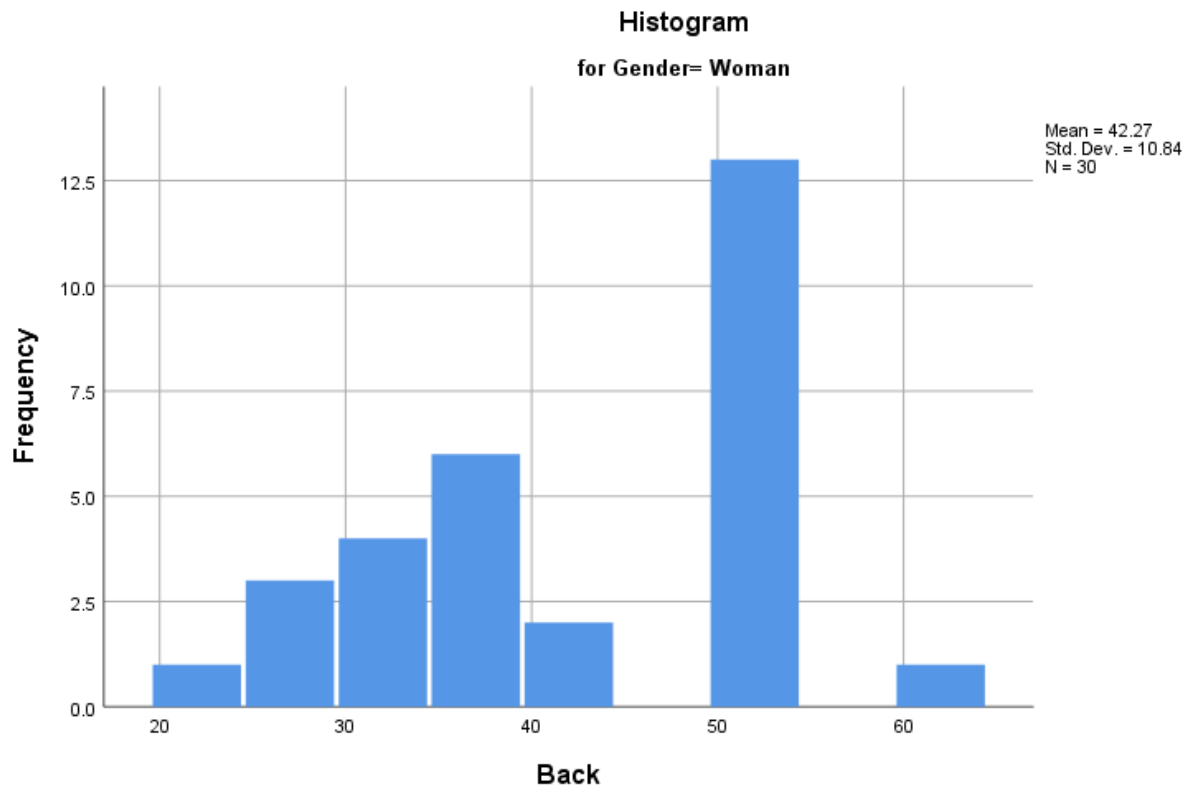
(b) Speed Histogram



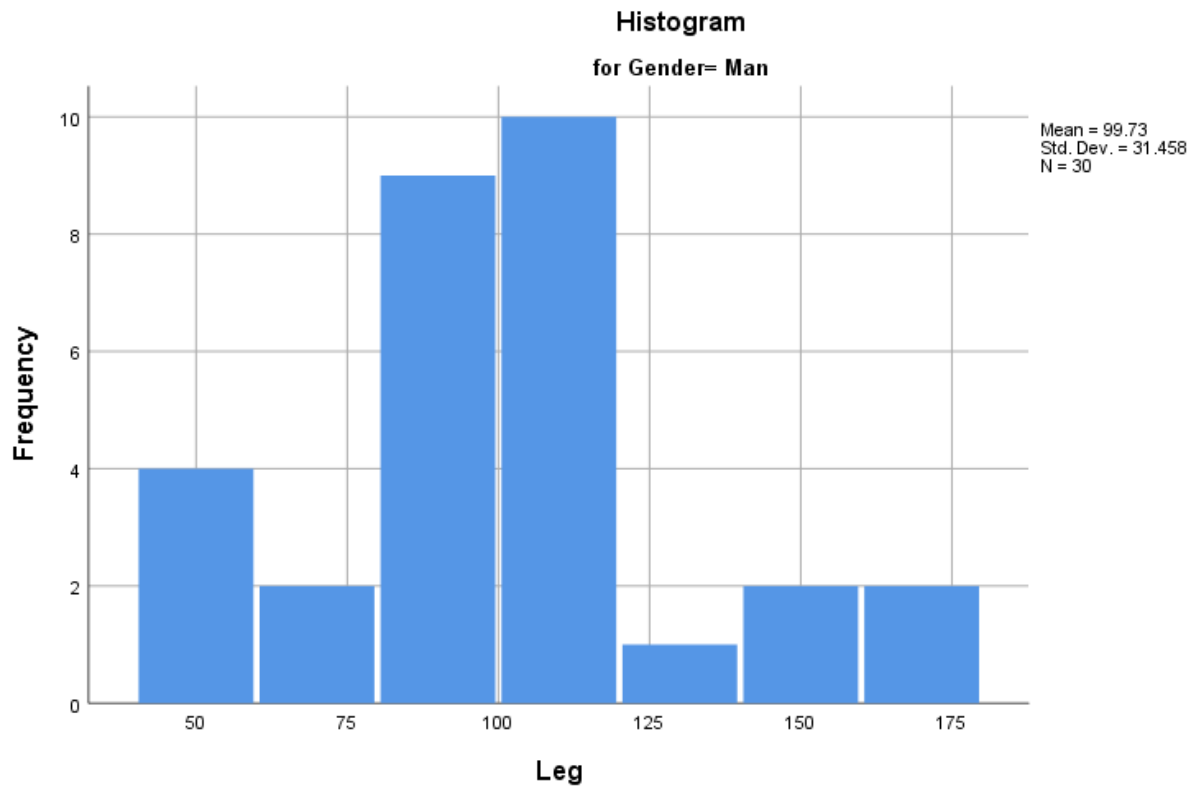
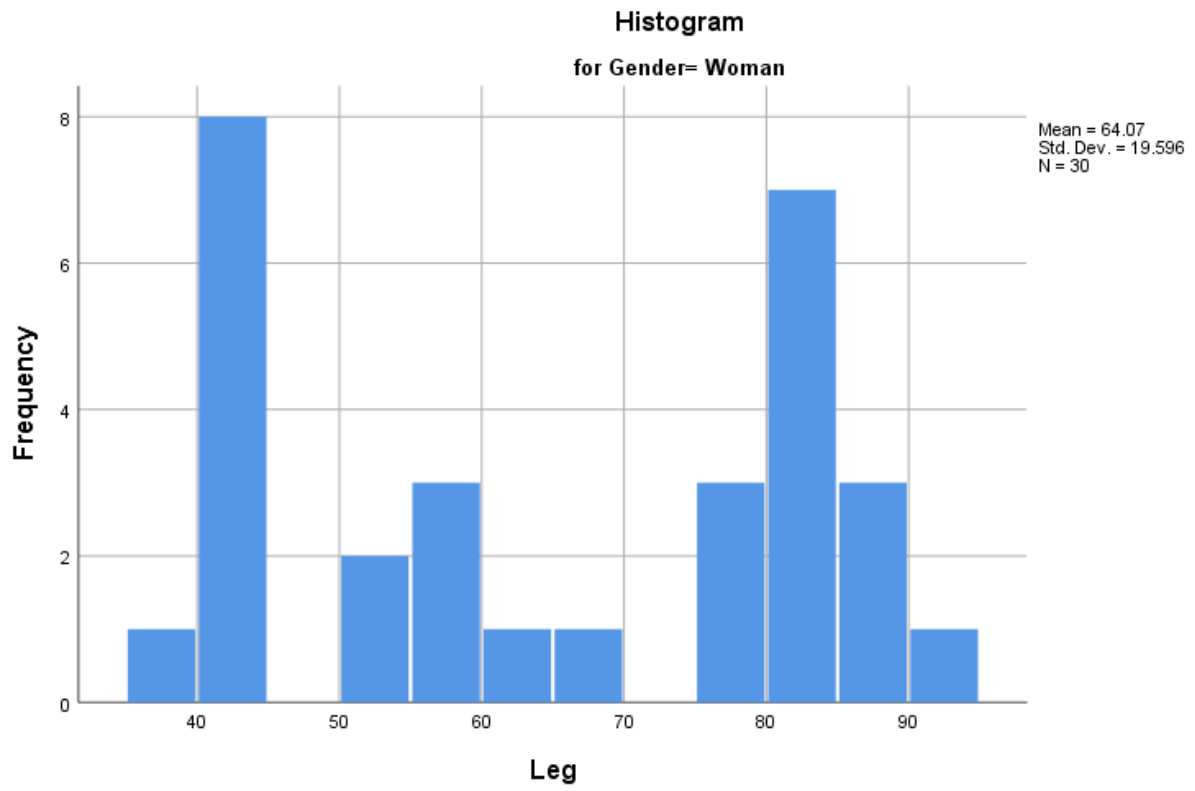
(c) Push-Up Histogram



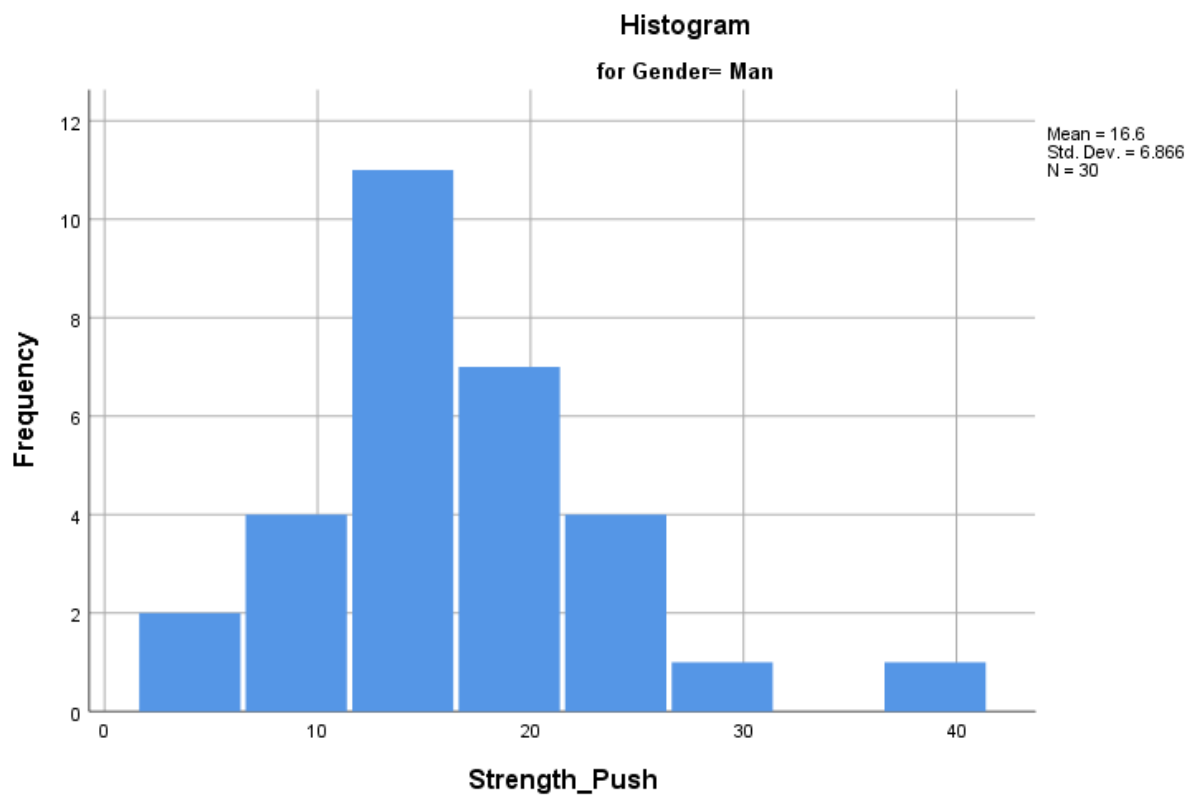
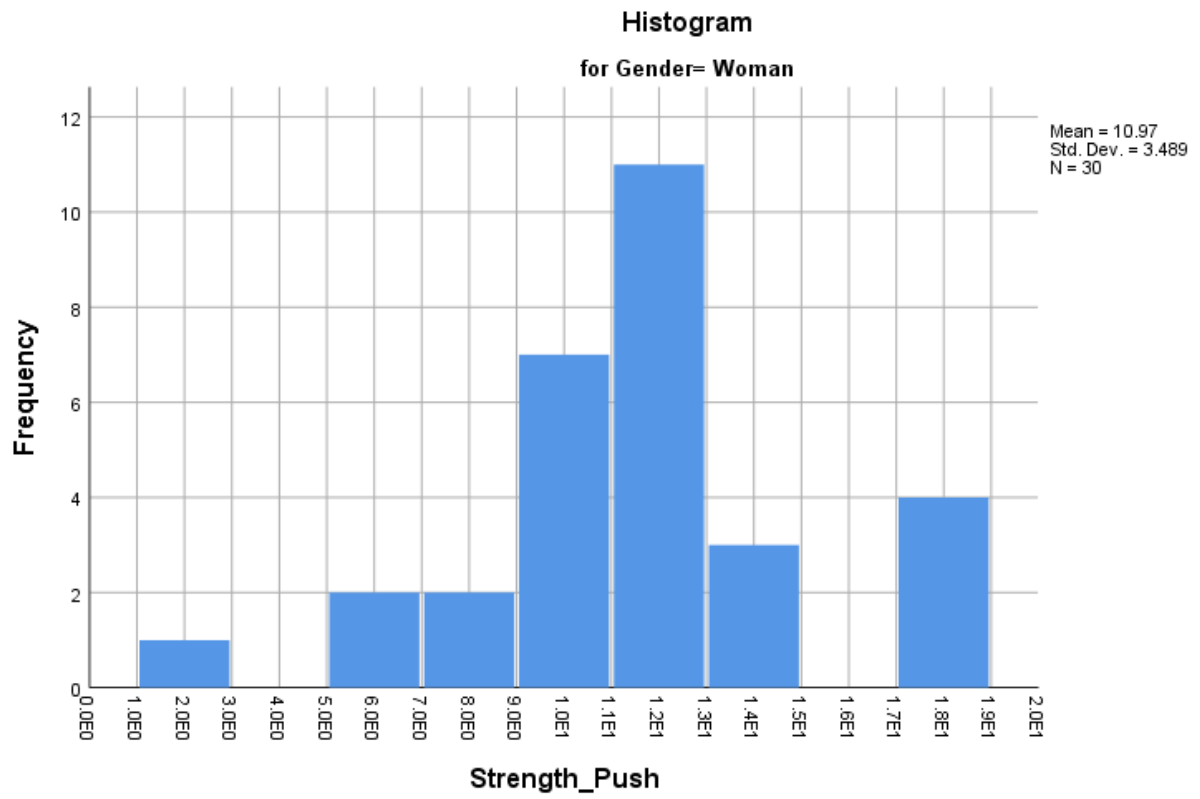
(d) Sit-Up Histogram



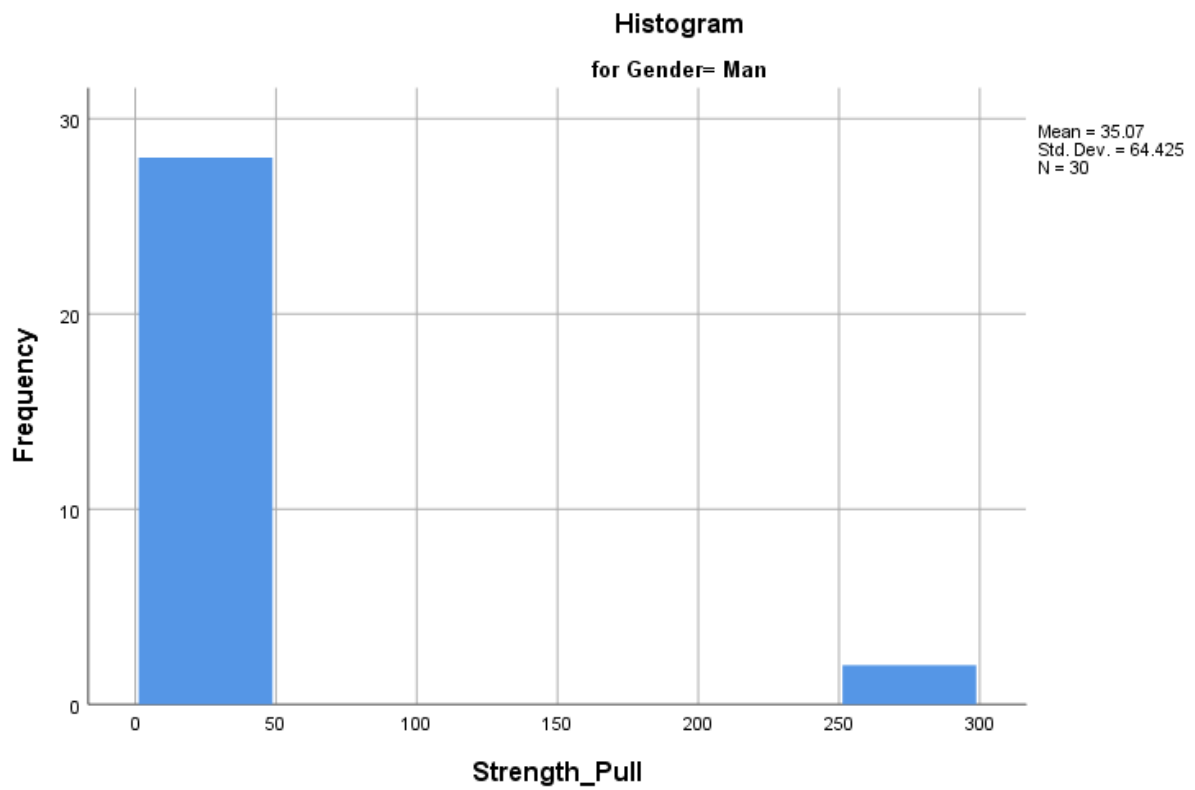
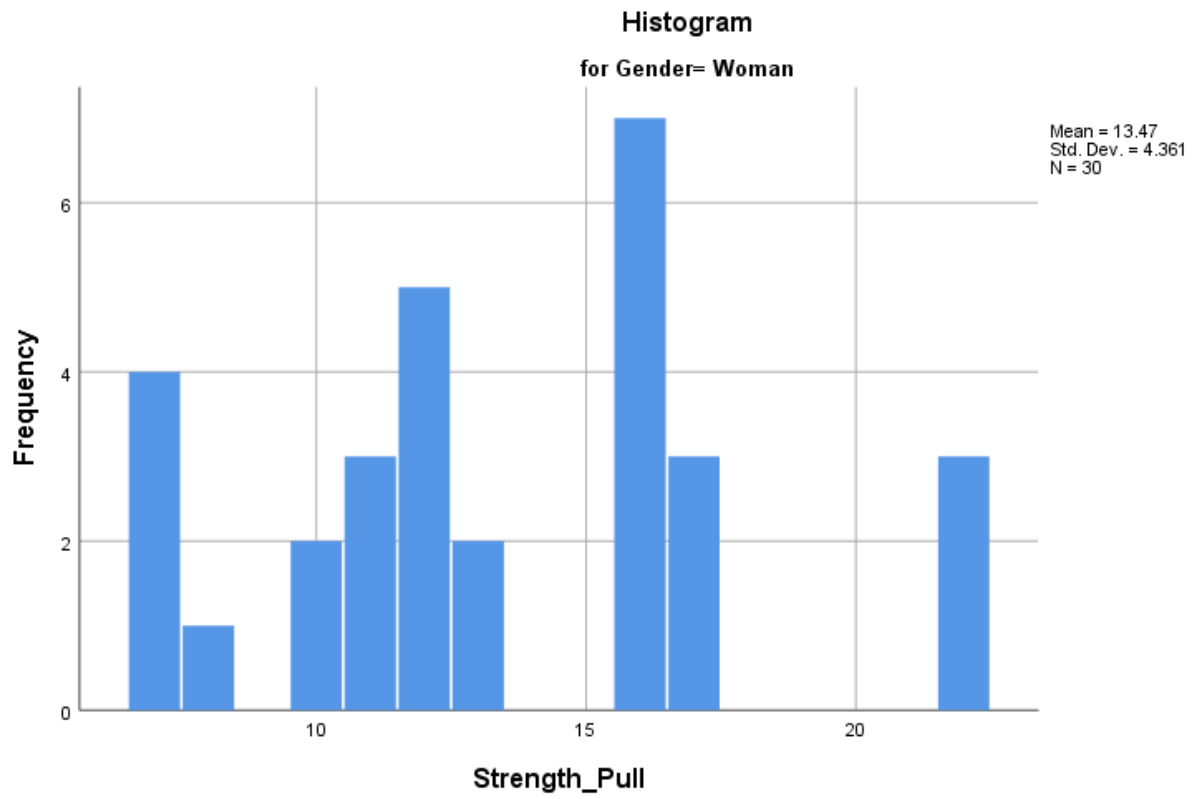
(e) Strength Back Dynamometer Histogram



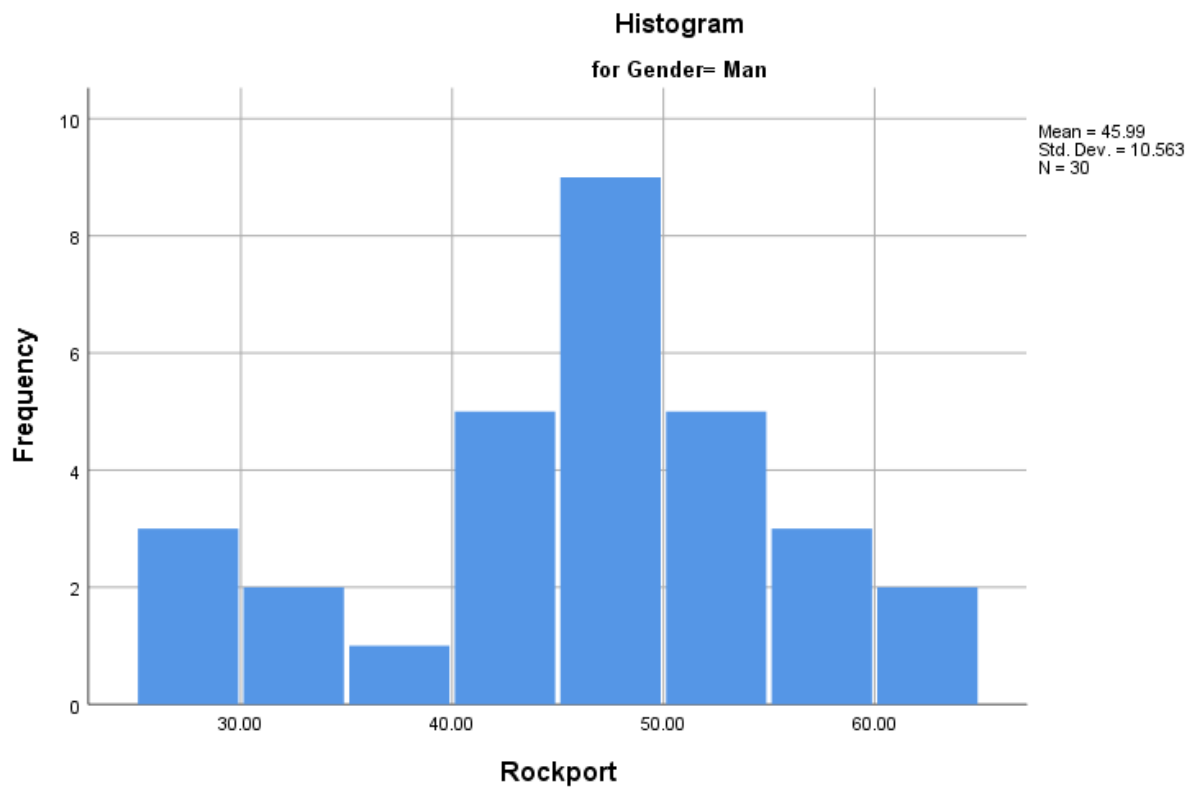
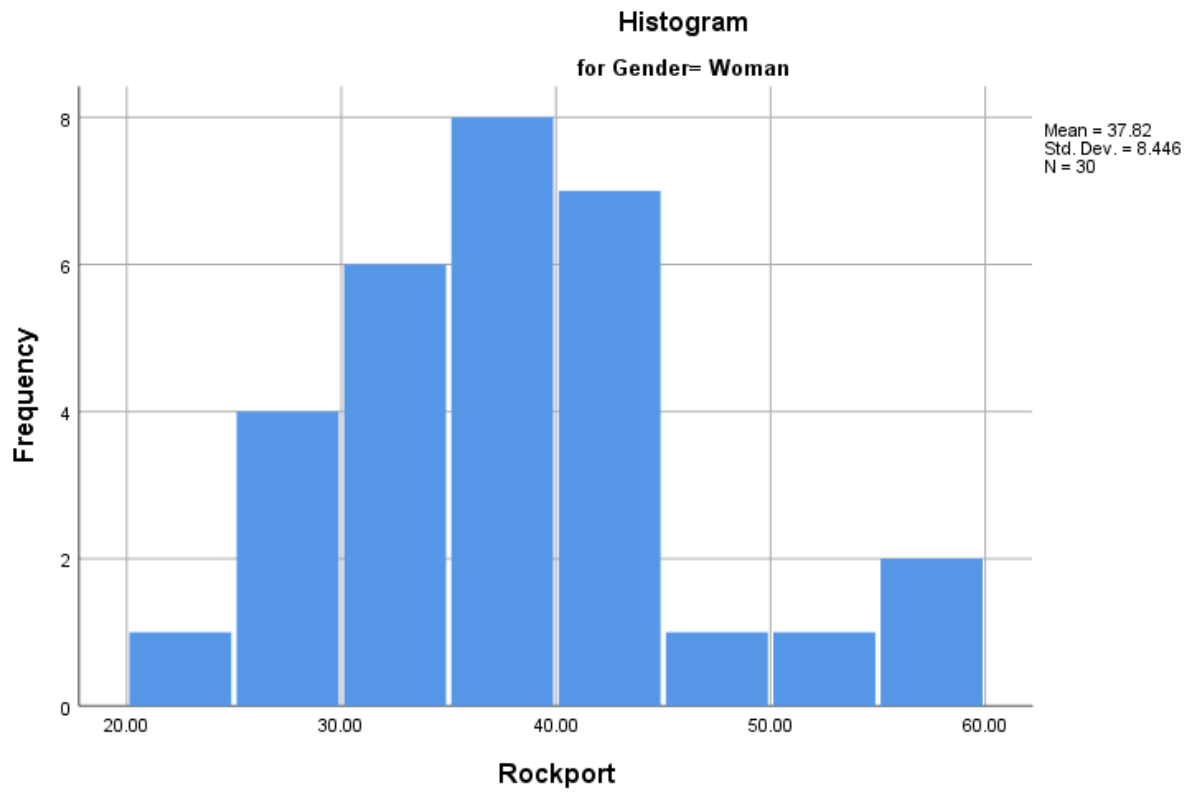
(f) Strength Legs Dynamometer Histogram



(g) Strength Push Dynamometer Histogram



(h) Strength Pull Dynamometer Histogram



(i) VO₂max Rockport Histogram

Figure 1. Part A-I Histogram Biomotor Test SOIna Athlete

From the evaluation results formulated by several experts in the field of coaching and physiology, there are several SWOT analyzes formulated, namely, Figure 1. Part a-h Histogram Biomotor Test SOIna Athlete.

3.5. SWOT Analysis

Researchers in large organizations, especially in physical education [15]. Many researchers and trainers conduct SWOT analysis on long-term and short-term training strategic planning especially for SOIna athletes. SWOT analysis is an established method for assisting the formulation of strategy [16]. Part analysis of strengths, weaknesses, opportunities, and threats (SWOT) has become a key tool used by coaches for strategic planning for exercise [17].

Investigating the Strengths, Weaknesses, Opportunities and Threats (SWOT) of training programs is popular among researchers and trainers [18] in large organizations. Lots of coach perform SWOT analysis on strategic planning [19], quality control and formulate policies and regulations [20].

3.6. Strength

From the athlete's fitness program which is controlled every 3 months, it allows the coach to see performance and fitness indicators from several test instruments that take place in the laboratory, with the analysis of the trainer being able to apply several aspects of training to cover the athlete's shortcomings, for the condition of the athlete who has not been training for a long time during the COVID-19 pandemic in Indonesia. It's been 2 years of exercising directly in the field, only seeing training or training through zoom meetings. With this analysis, can have a positive impact for athletes to improve peak performance.

3.7. Weakness

The weakness of this method is that some athletes do not fully follow the instructions of the coach properly, so the results of this biomotor test must be repeated, this can fully be done optimally considering the condition of athletes who have deficiencies, and other things, namely the role of parents who are less promote will affect the child's test, because parents must always accompany the athlete during training and testing.

3.8. Opportunity

In this case, there is a very large opportunity obtained by this analysis with a period of every 3 months, it will allow an increase in athlete performance, as well as train athletes' biomotor components that are still lacking, so that they can produce or get previously targeted achievements in the training program.

3.9. Threat

The biggest threat in the tests and exercises carried out by SOIna athletes is the role of parents in guiding and controlling children, which absolutely affects the child's fitness condition, if the role of parents is no longer supportive in this program it will have an impact on children being lazy to exercise, so it can threaten medals in matches that have been determined by the coach.

4. Conclusions

From several biomotor tests of SOIna athletes that have been carried out, the following conclusions can be drawn: (1) The condition of athletes has decreased both in terms of fitness and strength, this is due to several factors such as infrequent exercise and the COVID-19 pandemic that took place in Indonesia, which affected the athletes' condition, (2) the role of parents in guiding their children to keep training in helping coaches improve performance is very influential on physical and mental conditions in competing (3) This SWOT analysis is expected to help the coach's training program to continue to improve the athlete's technique and physicality and mental competition after the process is carried out this biomotor test.

Acknowledgements

We are very grateful to the organizers of the international seminar conference on sport science, physical education, and health, Jakarta State University as the host, and hrpub.org as the organizer for publishing articles.

REFERENCES

- [1] A. Shree and P. C. Shukla, "Intellectual Disability: Definition, classification, causes and characteristics," *Learn. Community-An Int. J. Educ. Soc. Dev.*, vol. 7, no. 1, p. 9, 2016, doi: 10.5958/2231-458x.2016.00002.6.
- [2] APA, "Diagnostic and statistical manual of mental disorders," 5th ed., A. P. Association, Ed. American Psychiatric Association, 2013.
- [3] A. I. Akhmetzyanova, "The development of self-care skills of children with severe mental retardation in the context of Lekoteka," *World Appl. Sci. J.*, vol. 29, no. 6, pp. 724-727, 2014, doi: 10.5829/idosi.wasj.2014.29.06.13922.
- [4] L. Misener and S. Darcy, "Managing disability sport: From athletes with disabilities to inclusive organisational perspectives," *Sport Manag. Rev.*, vol. 17, no. 1, pp. 1-7, 2014, doi: 10.1016/j.smr.2013.12.003.
- [5] F. Kurniawati, A. A. De Boer, A. E. M. G. Minnaert, and F. Mangunsong, "Characteristics of primary teacher training programmes on inclusion: a literature focus," *Educ. Res.*,

- vol. 56, no. 3, pp. 310–326, 2014, doi: 10.1080/00131881.2014.934555.
- [6] J. J. Martin and L. Whalen, “Effective Practices of Coaching Disability Sport,” *Eur. J. Adapt. Phys. Act.*, vol. 7, no. 2, pp. 13–23, 2014, doi: 10.5507/euj.2014.007.
- [7] M. Wouters, H. M. Evenhuis, and T. I. M. Hilgenkamp, “Systematic review of field-based physical fitness tests for children and adolescents with intellectual disabilities,” *Res. Dev. Disabil.*, vol. 61, pp. 77–94, 2017, doi: 10.1016/j.ridd.2016.12.016.
- [8] A. Oppewal, T. I. M. Hilgenkamp, R. van Wijck, and H. M. Evenhuis, “Cardiorespiratory fitness in individuals with intellectual disabilities-A review,” *Res. Dev. Disabil.*, vol. 34, no. 10, pp. 3301–3316, 2013, doi: 10.1016/j.ridd.2013.07.005.
- [9] E. J. Driessen *et al.*, “Effects of prehabilitation and rehabilitation including a home-based component on physical fitness, adherence, treatment tolerance, and recovery in patients with non-small cell lung cancer: A systematic review,” *Crit. Rev. Oncol. Hematol.*, vol. 114, pp. 63–76, 2017, doi: 10.1016/j.critrevonc.2017.03.031.
- [10] S. Stevens, “‘Physical’ fitness,” *Appliance*, vol. 53, no. 10 I, pp. 14–20, 1996.
- [11] J. L. Nuzzo, “The Case for Retiring Flexibility as a Major Component of Physical Fitness,” *Sport. Med.*, vol. 50, no. 5, pp. 853–870, 2020, doi: 10.1007/s40279-019-01248-w.
- [12] K. Storey, “The Case Against the Special Olympics,” *J. Disabil. Policy Stud.*, vol. 15, no. 1, pp. 35–42, 2004, doi: 10.1177/10442073040150010601.
- [13] P. Van De Vliet *et al.*, “Physical fitness profile of elite athletes with intellectual disability,” *Scand. J. Med. Sci. Sport.*, vol. 16, no. 6, pp. 417–425, 2006, doi: 10.1111/j.1600-0838.2006.00539.x.
- [14] M. M. Bergman and A. P. M. Coxon, “The quality in qualitative methods,” *Forum Qual. Sozialforsch.*, vol. 6, no. 2, 2005.
- [15] D. Leigh, “SWOT Analysis,” *Handb. Improv. Perform. Work.*, vol. 2, pp. 115–140, 2010, doi: 10.1002/9780470592663.ch24.
- [16] R. G. Dyson, “Strategic development and SWOT analysis at the University of Warwick,” *Eur. J. Oper. Res.*, vol. 152, no. 3, pp. 631–640, 2004, doi: 10.1016/S0377-2217(03)00062-6.
- [17] M. A. Benzaghta, A. Elwalda, M. Mousa, I. Erkan, and M. Rahman, “SWOT analysis applications: An integrative literature review,” *J. Glob. Bus. Insights*, vol. 6, no. 1, pp. 55–73, 2021, doi: 10.5038/2640-6489.6.1.1148.
- [18] P. Nigel and G. William, “Making SWOT Analysis Work,” *Mark. Intell. Plan.*, vol. 7, no. 5/6, pp. 5–7, 1989, [Online]. Available: <http://www.emeraldinsight.com/10.1108/EUM00000001042>.
- [19] M. M. Helms and J. Nixon, *Exploring SWOT analysis – where are we now?: A review of academic research from the last decade*, vol. 3, no. 3. 2010.
- [20] C. Namugenyi, S. L. Nimmagadda, and T. Reiners, “Design of a SWOT analysis model and its evaluation in diverse digital business ecosystem contexts,” *Procedia Comput. Sci.*, vol. 159, pp. 1145–1154, 2019, doi: 10.1016/j.procs.2019.09.283.