JURNAL PENDIDIKAN KEPELATIHAN OLAHRAGA
Volume 15 Nomor 3 2024
E-ISSN: 2614-6932
DOI: https://doi.org/10.23887/jjpko.v12i3

The Effect of Junior Weight Vest and Junior Weight Vest Training with Additional Loads on Crawl Style Swimming Speed Club Denpasar City

Ida Bagus Gede Jaya Mahotama[1], I Gusti Lanang Agung Parwata[2], Made Agus Wijaya[3], Wahjoedi[4]

[123] *Universitas Pendidikan Ganesha, Bali, Indonesia.*
**Korespodensi penulis: gusdemahotama111@gmail.com [1], agung.parwata@undiksha.ac.id [2], wijaya.madeagus@undiksha.ac.id [3]*

Abstrack

This study aimed to determine the effect of Junior Weight Vest training, Junior Weight Vest training with additional weights, and Junior Weight Vest training with additional weights is more effective than Junior Weight Vest training in increasing crawl style swimming speed. The study used a pseudo-experimental research design with a Pretest-Posttest Control Group Design. 40 Denpasar City swimming athletes chose as the research subjects were divided into 3 groups; experimental group 1 with Junior Weight Vest training, experimental group 2 with Junior Weight Vest training with additional weights, and conventional training control group. The data obtained in the form of crawl swimming style speed which was then calculated the gain score value and tested the hypothesis. The results showed that Junior Weight Vest training and Junior Weight Vest training with additional weights increased crawl style swimming speed significantly, and Junior Weight Vest training with additional weights was more effective in increasing the crawl style swimming speed of Denpasar City athletes than Junior Weight Vest training.

Keyword: *junior weight vest, speed, crawl style swimming*

History:
Received:
Revised:
Accepted:
Published:

Publisher: Undiksha Press

Introduction

Exercising is an activity that helps the body to move more freely, exercising can also increase the body's endurance so that it doesn't get sick easily. If exercise is done regularly and meets the principles of training, it can produce an athlete capable of producing sport achievements. Sports performance in general requires the application of training principles so that sports performance can increase. Training must be guided by correct and systematic theory and training principles because if this is not done then achievement will be difficult to achieve. Achievement sports require a lot of support from various scientific disciplines to achieve maximum performance. Coaches and athletes use technology in performance sports to support the optimal training process.

One of the sports achievements is swimming. Swimming is an aquatic sport with the main movements of the arms and legs to produce pushing power so that the body as a whole moves or glides forward. Swimming is a sport that is competed at district, provincial, and international levels, competing in at least 4 (four) main styles for both male and female athletes. According to Januar Abdilah Santoso, et al (2020:8), there are 4 (four) main styles in

swimming, namely: 1) butterfly stroke, 2) backstroke, 3) breaststroke), and 4) freestyle or crawl (freestyle). One swimming style that is generally widely studied and is easier to do compared to other swimming styles, is freestyle or crawl style.

Crawl style swimming is a swimming style that is generally known as freestyle. The crawl style of swimming is mostly popular because the technique of this style is easier than others. In this style, the swimmer swims with the nape facing forward, alternately makes hand movements, and makes leg movements like a free kick. The crawl style is often used in swimming competitions and is one of the main swimming styles. In crawl style swimming, the biggest contributor to speed comes from alternating arm swings and leg thrusts. The integration of arm swing movements and leg thrust produces optimal swimming speed.

The swimming speed training of crawl style is currently the focus of Bali swimming coaches. Various training methods are implemented using tools in the form of ballboys, boards, and Junior Weight Vests. Swimming speed training using ballboys and boards is commonly used, while the use of junior weight vests is not widely used. Based on preliminary observations and observations that researchers have conducted on athletes who are members of the Denpasar City swimming club, researchers know that the use of the Junior Weight Vest has never been used as an additional load. Some athletes do not understand weight training beyond their own body weight in swimming, and training methods to increase swimming speed have not been widely used. This is the focus of researchers to conduct research on the effect of Junior Weight Vest and Junior Weight Vest training with additional weights on the crawl style swimming speed of athletes at Denpasar City swimming club.

The essence of training discusses two main things, namely the meaning of training and the principles of training. The general definition of training is all the power and effort to improve overall physical condition through a systematic and repetitive process with increasing day by day the amount of training load, time, or intensity. According to Bompa, 1994 (in Rahmat Hermawan, 2016) training is a sports activity that is systematic, progressive, and conducted over a long period according to the individual level, which continues to form human physiological and psychological functions to fulfill the requirements imposed on them. Sukadiyanto (2005), states that exercise is in principle a process of change for the better, namely to improve the physical quality and functional capabilities of the body's equipment. Some principles must be adhered to when training. According to Dikdik Zafar Sidik, et al, (2019), training consists of eight main principles such as; The principle of overload (overload principle), the principle of comprehensive development (multilateral development), the principle of specificity, the individual principle, intensity of training, quality of training, variety of training, and the principle of original recovery.

Swimming is a very fun sport and is suitable for anyone regardless of age. Swimming is a type of sport that is popular in society. Swimming is a sport that can be taught to children and adults, even babies aged a few months can start to be taught swimming (Dwijowinoto, 1979: 1). The meaning of swimming, which seems to be still related, is outlined in the Swimming Theory Module I, Badruzaman (2007: 13) suggests that: "The general meaning of swimming is the floatation of an object in a liquid due to its buoyancy or lift." that means that the general definition of swimming is an effort to float or lift the body above the surface of the water.

Freestyle or crawl style is swimming with the chest position facing the water surface. Both arms are alternately moved far forward in a paddling motion, while both legs are alternately whipped up and down, up and down. Freestyle is the fastest swimming style compared to other styles. (Farizal Imansyah & Akbar Tanjung, 2020). Crawl style swimming is one of the fastest styles in swimming. Water is a fluid substance that acts as a medium to

resist when swimming crawl style, so that there is a push forward, but at the same time the water also causes resistance. (Pratama, Setya, & Sugiarto, 2014).

The weighted vest is intended for those who want to increase the intensity of training such as doing push ups, sit ups, pull ups, squats, and various variations of exercise to increase strength and power as well as endurance and speed. By using a weighted vest, more energy is needed during exercise so it can result in better fat loss. The power and energy used when doing exercises using a weighted vest trains the brain and muscles and the body to react similarly when not using a weighted vest, thus allowing the body to produce strength, speed, agility, and endurance that may have never been produced before (Wardhana, 2013).

The weighted vests have been used as weight training since 1978, which is applied to soldiers in military education. Using vests in military training has been proven to increase the strength of soldiers in their physical abilities. The very safe characteristics of the vest make it possible for it to be applied to children. The use of aluminum cans as raw material for this weighted vest is a green industry-based product development, so it is very helpful in reducing the impact of global warming due to aluminum can waste. The development of an environmentally friendly weight vest for junior athletes was developed over three years under the name Junior Weight Vest (JWV) (Dharmadi, 2021).

Speed is one of a person's basic movement abilities in conducting short movements. The element of speed is found in almost all sports, in swimming speed is an absolute thing and is a support and benchmark for achievement, especially in freestyle swimming. In freestyle swimming, the element of speed is very necessary, one of which is the speed of movement which greatly influences the course of the body in the water. Thus, if a swimmer has good speed, then the swimmer will reach the finish quickly and have a chance of winning.

Speed is a conditional quality that allows a person to make movements and react quickly to stimuli (Shava et al., 2017; Yeni et al., 2019), resulting in movement from one place to another quickly (Yeni et al., 2019). Speed in swimming can be developed to the maximum because essentially every human being has a competitive nature and competes to always achieve (Farizal & Akbar, 2020). These descriptions illustrate that swimming is a sport that is of interest to people from various circles who are more focused on physical condition, especially speed. Remember that speed is one of the determinants of an athlete's success or achievements.

Several previous studies related to the use of weight vests include Dharmadi (2021) with the title "An Analysis of Junior Weight Vest Development to Improve Physical Abilities of Junior Athletes" concluding that Based on the analysis and discussions that have been conducted, coaches and sports experts need development of the Junior Weight Vest for junior athletes. This development has many benefits that can help junior athletes improve their physical abilities gradually by the principles of sports coaching. Yusup (2021) "The Effect of Implementing Interval Method Using Weighted Vest on Power Endurance Abilities Pusaka Angle's Players". In his research, he concluded that there was an effect of interval training using a weighted vest on increasing the power endurance abilities of Pusaka Angel female futsal athletes. Increasing the athletes' power endurance abilities had a positive impact on the athletes' performance in the competition. Susanto (2023). In his research entitled "The Effect of Weighted Vest and Resistance Band Training on Increasing Leg Muscle Power in IBA MMA Undikma Camp Athletes". Based on the analysis that has been conducted there is an influence of weighted vest and Resistance Band training on leg muscle power in IBA MMA Undikma Camp athletes. Furthermore, this research was conducted to contribute to increasing sources of knowledge regarding the use of Weight Vests and their effect on crawl style swimming speed, especially for athletes from Denpasar City.

Research Methode

This research is included in experimental research. Experimental research is research to determine the consequences of the treatment given to something being researched (Sugiyono, 2018). The experimental method is research that involves manipulating external variables and measuring the effect of the independent variable on the dependent variable (Hastjarjo, 2019). The research design used in this research is a Pretest-Posttest Control Group design with two types of treatment. According to Suharsimi Arikunto (2020: 277), the Pretest-Posttest Control Group design with two types of treatment is an extension of the Pretest-Posttest Control Group design with one type of treatment. There are two types of treatment in the two experimental groups. In this design, there are three groups, namely 2 experimental groups and 1 comparison group. Below is a picture of the experimental research design Pretest-Posttest Control Group design with two types of treatment.

Tabel 1. Pretest-Posttest Control Group Design Research Design
(Source: Arikunto, 2020: 277)

Grup	Pretest	Treatment	Postest
E_1	O_1	X	O_2
E_2	O_1	X	O_2
K	O_1		O_2

Information:

E_1 = Experimental group 1 (Junior Weight Vest training)
E_2 = Experimental group 2 (Junior Weight Vest training with additional weights)
K = Control group
O_1 = Initial test (*Pretest*)
O_2 = Final test (*Posttest*)

This research was conducted at the Praja Raksaka Swimming Pool, Denpasar City involving 3 (three) swimming clubs, namely Elang Laut SC, Telaga Biru SC (TBSC), and Tirta Harapan SC in 2024. The research subjects designed to be actively involved in this research were 40 people from 3 swimming clubs in Denpasar City. Below is displayed the data on the subjects of this research.

Table 2. Research Subjects

No.	**Denpasar City Swimming Club**	**Number of Subjects**
1	Elang Laut Swimming Club	10 people
2	Telaga Biru Swimming Club	20 people
3	Tirta Harapan Swimming Club	10 people
	Total Population	40 people

The divisions are grouped using ordinal pairing, where groups are formed using an ordering system that describes ranking. The ordinal pairing technique is conducted by entering the pre-test result data which has been sorted into the following image:

Table 3. Division of Research Subjects using the Ordinal Pairing Technique

E_1	1	6	7	12	13	18	19	24	25	30	31	36	37	
E_2	2	5	8	11	14	17	20	23	26	29	32	35	38	
K	3	4	9	10	15	16	21	22	27	28	33	34	40	41

Figure 2. Division of Research Subjects using the Ordinal Pairing Technique

Information:

E_1 = Experimental group 1 (Junior Weight Vest training)

E_2 = Experimental group 2 (Junior Weight Vest training with additional weights)

K = Control group

Referring to the division of research subjects using the ordinal pairing technique as in Figure 2, the number of members of the research subject group in this study looks like Table 2.

Table 4. Research Subjects in Each Treatment

Sample Code	Research Group	Number of Subjects
E_1	Junior Weight Vest training	13 people
E_2	Junior Weight Vest training with additional weights	13 people
K	Control Group	14 people
	Total	40 people

This study consisted of 3 groups where each group member conducted an initial test (O1), namely experimental group 1 (E1), experimental 2 (E2), and control group (K). Experimental group 1 was given treatment (X1), namely Junior Weight Vest training exercises, and experimental group 2 was given treatment (X2), namely Junior Weight Vest training with additional weights, and the control group was given a conventional training program, namely exercises conducted according to the usual training program. After eight weeks of practice, a final test/posttest (O2) was conducted out on the three experimental groups 1 (E1), experimental 2 (E2), and the control group (K).

In this study, training was conducted in stages, namely introduction, warm-up, core training, and calming. For example, training is designed for 1 hour 30 minutes (90 minutes), then the time distribution is as follows:

Table 5. Training Stages

Introduction (5’)
Warm-Up (20’)
Training (50’)
Cool-Down (15’)

The first stage is the preliminary, preparation of facilities and infrastructure, attendance, prayer, and providing motivation, as well as conveying training objectives to athletes. The second stage, Warm-up, is conducted before training or competition to prepare the athlete physically and mentally through a process of movement to avoid injury. Next, the core training stage is conducted to improve physical condition, technique, and tactics for athletes so they can conduct sports activities with maximum performance. Then it ends with the final stage, calming, which is an important stage in a training session that aims to bring the body slowly back to normal condition after experiencing intense physical activity which is conducted by gradually reducing the intensity of the activity.

To obtain the data needed in this research, there are 2 (two) data collection methods used, namely the test method and the documentation method. The test method is a measurement technique that contains a series of tasks that must be conducted by certain subjects (Arifin, 2012: 226). For the test method, the instrument used in this research is a 50 meters crawl style swimming test based on the FINA Handbook and the assessment is taken from the swimmer's maximum time and speed in seconds during the pretest and posttest. Meanwhile, for the documentation method, research data was obtained in the form of a list of names and a list of achievements from the 50 meters crawl style swimming speed test.

The data obtained through experiments was then analyzed in two stages, namely prerequisite testing and hypothesis testing. The first stage was a normality test using the Kolmogorov Smirnov Test statistic, and a data homogeneity test was tested using the Levene test. From the calculation results, the most important is Levene's Test of Equality of Error Variances table which contains the results of the variance homogeneity test. Then in the second stage, hypothesis testing was conducted using a one-way analysis of variance (Anava) test designed to investigate differences in the influence of the two variables studied. The research hypothesis is tested for truth based on data obtained from the sample (Candiasa, 2019:91). This hypothesis test will use a two-way Anava test using SPSS 24.0 for Windows. The hypothesis is accepted if the one-way Anava test value has a significance value smaller than $\alpha = 0.05$, whereas if the significance value is greater than $\alpha = 0.05$, then the hypothesis is rejected. If there is a difference, the Scheffe test will be continued to find out which group is significantly better.

Result and Discussion

The data obtained from the research is in the form of crawl style swimming speed data obtained from the pretest and post-test. Then the data is searched for the calculation of the gain score value. After calculating the gain score value, it is then analyzed in SPSS 24.0 for Windows. There are 3 main data from 3 groups which are the focus of data collection with their respective treatments.

First, data from the results of research on crawl style swimming speed in the Junior Weight Vest Training Treatment Group are presented in table 3 below.

Table 6. Crawl Style Swimming Speed in the Junior Weight Vest Training Treatment Group

Variable Data	Junior Weight Vest Training Treatment Group		
	Pre-test	**Post-test**	**Gain Score**
N	13	13	13
Mean	25,67	25,62	0,05
Standar Deviation	0,32	0,33	0,02
Range	1,13	1,18	0,06
Minimum	24,97	24,88	0,03
Maximum	26,10	26,06	0,09

Pre-test and post-test results data can be obtained data on the increase (gain score) of the crawl style swimming speed of the Junior Weight Vest training treatment group, namely obtained an average time of 0.05 seconds with a standard deviation of 0.02 seconds, the lowest time of 0.03 seconds, the highest time was 0.09 seconds with a period of 0.06 seconds. The gain score data for the Junior Weight Vest training treatment group can be explained using a histogram diagram which can be seen in the following diagram.

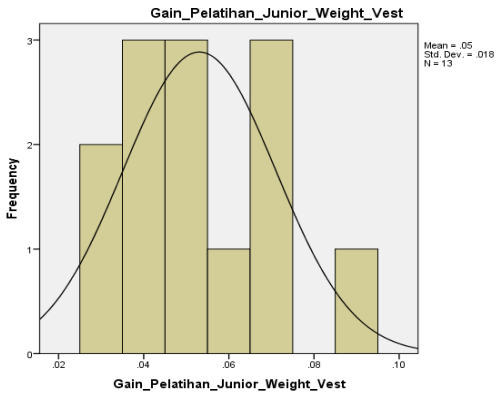

Diagram 1. Histogram Diagram of Crawl Style Swimming Speed in Groups Junior Weight Vest Training Treatment

Second, data from research on crawl style swimming speed in the junior weight vest training treatment group with additional loads is presented in table 4 below

Table 7. Crawl Style Swimming Speed in the Junior Weight Vest Training Treatment Group with Additional Loads

Variable Data	Junior Weight Vest Training Treatment Group with Additional Loads		
	Pre-test	**Post-test**	**Gain Score**
N	13	13	13
Mean	25,69	25,61	0,08
Standar Deviation	0,28	0,29	0,02
Range	0,92	0,95	0,08
Minimum	25,20	25,08	0,04
Maximum	26,12	26,03	0,12

Pre-test and post-test results data can be obtained data on the increase (gain score) of the crawl style swimming speed of the Junior Weight Vest training treatment group with additional loads, namely an average time of 0.08 seconds with a standard deviation of 0.02 seconds. , the lowest time is 0.04 seconds, the highest time is 0.12 seconds with a time range of 0.08 seconds. The gain score data for the Junior Weight Vest training treatment group with additional loads can be explained through a histogram diagram which can be seen in the following diagram.

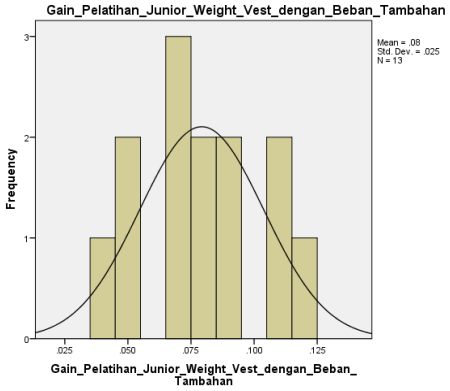

Diagram 2. Histogram Diagram of Crawl Style Swimming Speed in the Junior Weight Vest Training Treatment Group with Additional Loads

Third, data from research on crawl style swimming speed in the control group are presented in table 5 below.

Table 8. Crawl Style Swimming Speed in the Control Group

Variable Data	Control Group		
	Pre-test	**Post-test**	**Gain Score**
N	14	14	14
Mean	25,73	25,70	0,03
Standar Deviation	0,30	0,30	0,01
Range	0,93	0,91	0,04
Minimum	25,27	25,25	0,01
Maximum	26,20	26,16	0,05

Data from the pre-test and post-test results can be obtained data on the increase (gain score) of the crawl style swimming speed of the control group, namely that an average time of 0.03 seconds was obtained with a standard deviation of 0.01 seconds, the lowest time was 0.01 seconds, the highest time is 0.05 seconds with a time range of 0.04 seconds. The gain score data for the control group can be explained using a histogram diagram which can be seen in the following diagram.

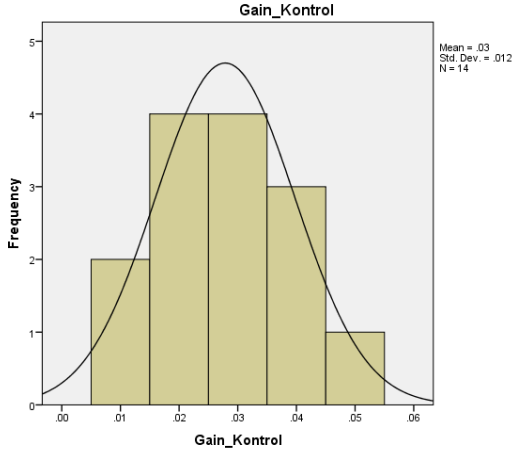

Diagram 3. Histogram Diagram of Crawl Style Swimming Speed in the Control Group

Based on the research results, several findings were obtained. First, Junior Weight Vest training can significantly increase the crawl swimming speed of Denpasar City athletes. The use of weights in the form of a Junior Weight Vest is a concept of weight training using weights attached to the athlete's body in the form of a weight-filled vest called a Junior Weight Vest (Gerhart et al., 2020). The use of the Junior Weight Vest has increased muscle contractions in athletes because the weight on the Junior Weight Vest makes the body contract more to support the load (Dharmadi, 2022). This contraction will physiologically force the muscles to work harder and expend more energy so that the training intensity and overweight training principles can be achieved. Increased arm muscle strength in each athlete after using the Junior Weight Vest in training. Endurance/load-bearing training for children can improve physical abilities and performance in sports (Setiawati & Hadiana, 2016). In addition, using the Junior Weight Vest in training has trained the body to accept more load than usual when not using the Junior Weight Vest. This causes the body to make adjustments due to weight training until it feels light when the Junior Weight Vest is removed. With a light body, athletes will find it easy to conduct training, so they will become stronger, faster, and more agile in the next training session. Therefore, weight training using additional weight on the body is very important for strength, speed, and agility. It is believed that the benefits

of weighted vests can be used as a physical training tool to improve athletes' performance in terms of speed, jumping strength, and agility (Dharmadi et al., 2021). Based on these theories, it can be revealed that Junior Weight Vest training can increase swimming speed, and crawl style swimming speed because Junior Weight Vest can train the body to accept more load than usual. This causes the body to make adjustments due to weight training until it feels light when the Junior Weight Vest is removed. With a light body, athletes will become stronger, faster, and more agile.

Second, Junior Weight Vest training with additional weights can significantly increase the crawl swimming speed of Denpasar City athletes. The use of weights in the form of a Junior Weight Vest is a concept of weight training using weights attached to the athlete's body in the form of a weight-filled vest called a Junior Weight Vest (Gerhart et al., 2020). The power and energy used when doing exercises using a Weight Vest trains the brain and muscles and the body to react similarly when not using a Weight Vest, thus allowing the body to produce strength, speed, agility, and endurance that may have never been produced before (Wardhana, 2013). The use of weights can increase a lifter's explosive power by increasing movement speed without reducing the joint range of motion or overall lifting technique (Pratiwi et al., 2020). Weight training using additional weight on the body is essential for strength, speed, and agility. Junior Weight Vest can improve physical abilities and is safe to wear (Krakan et al., 2020). Based on these theories, it can be revealed that Junior Weight Vest training with additional weights can increase swimming speed, and crawl style swimming speed because the heavier additional weight can train the body to accept more load than usual. This causes the body to make adjustments due to weight training until it feels light when the weighted vest is removed. With a light body, athletes will become stronger, faster, and more agile.

Third, based on the one-way ANOVA test, it is known that Junior Weight Vest training with additional weights is more effective in increasing the crawl speed and swimming speed of Denpasar City athletes compared to Junior Weight Vest training. This is very reasonable because by using a Junior Weight Vest with additional weights, contraction occurs against a greater resistance force compared to the Junior Weight Vest. So that athletes have better muscle strengthening and toning and ultimately the muscles will develop according to the resistance given during weight training. Weight training is also known to be able to absorb oxygen in the body so that exercise can be more efficient and improve muscle performance (Tambing et al., 2020). This means that if it added more weight during training, the increase in arm muscle strength will be higher. This causes Junior Weight Vest training with additional weights to be more effective in increasing crawl style swimming speed.

Conclution

Based on the results of data analysis and discussion, the research results show conclusions such as; Junior Weight Vest training can significantly increase the crawl style swimming speed of Denpasar City athletes, Junior Weight Vest training with additional weights can significantly increase the crawl style swimming speed of Denpasar City athletes, and Junior Weight Vest training with additional weights is more effective in increasing swimming speed crawl style of Denpasar City athletes compared to Junior Weight Vest training.

There are suggestions for further learning and research processes. For swimming coaches, Junior Weight Vest training with additional weights is an alternative training that can be implemented in clubs to optimize the crawl style swimming speed of Denpasar City athletes. Coaches should teach material or practices related to physical training in a more varied way so that it will have a direct effect on athletes. This research only analyzes the effect of Junior Weight Vest and Junior Weight Vest training with additional weights on

crawl style swimming speed. In the future, research can be conducted to examine the effect of Junior Weight Vest and Junior Weight Vest training with additional weights on other sports, such as basketball, futsal, volleyball, and *pencak silat*.

Reference

Abdilah Santoso, J., dkk (2020). Praktik Renang: modul mata kuliah.

Arifin, Zainal. 2012. Penenlitian Pendidikan Metode dan Paradigma Baru. Bandung: Remaja Rosda Karya.

Arikunto, S. 2019. *Prosedur Penelitian*. Jakarta: Rineka cipta.

Badruzaman (2007). Pengertian Renang Secara Umum.

Candiasa, I. M. (2019). Analisis Data dengan Statistik Univariat dan Bivariat. Singaraja: Undiksha Press.

Dharmadi, M. A., (2021). An Analysis of Junior aWeight Vest Development to Improve Physical Abilities of Junior Athletes. *International Journal of Human Movement and Sport Sciences*, 9(3). 466-472.

Dharmadi, M. A. (2022). The Use of Junior Weight Vest on Arm Strength in Junior Pencak Silat Athletes. *Indonesian Journal Of Educational Research and Review*, *5*(3), 614–623. https://doi.org/10.23887/ijerr.v5i3.52391

Farizal Imansyah, & Akbar Tanjung. (2020). Analisis Kecepatan Renang Gaya Bebas Pada Atlet Sekolah Olahraga Negeri Sriwijaya (Sons). *Penjaskesrek Journal*, *7*(1), 188–203. https://doi.org/10.46244/penjaskesrek.v7i1.1017

Gerhart, H. D., Pressl, R., Storti, K. L., Bayles, M. P., & Seo, Y. (2020). The effects of a loaded rucksack and weighted vest on metabolic cost and stride frequency in female adults. Ergonomics, 63(2), 145–151. https://doi.org/10.1080/00140139.2019.1710266.

Hastjarjo, T. Dicky. 2019. Rancangan Eksperimen-Kuasi Quasi-Eksperimental Design. Jurnal Buletin Psikologi. Vol. 27, No. 2. Yogyakarta : Universitas Gadjah Mada.

Krakan, I., Milanovic, L., & Belcic, I. (2020). Effects of Plyometric and Repeated Sprint Training on Physical Performance. Sports, 8(7), 1–13. https://doi.org/10.3390/sports8070091.

Pratama, A. B., Setya, R., & Sugiarto. (2014). Pengaruh Viskositas Air Kolam Renang Terhadap Kecepatan Renang Gaya *Crawl*. *Journal of Sport Sciences and Fitness*, *3*(2), 17–24. Retrieved from http://journal.unnes.ac.id/sju/index.php/jssf

Setiawati, E., & Hadiana, O. (2016). Pengaruh Latihan Leg Press Terhadap Peninngkatan Power Otot Tungkai Pada Atlet Pencak Silat. JUARA : Jurnal Olahraga, 1(1), 39 – 45. https://doi.org/10.33222/juara.v1i1.53.

Shava, I., Kusuma, D. W. Y., & Rustiadi, T. (2017). Latihan Plyometrics dan Panjang Tungkai terhadap Kecepatan Renang Gaya Dada Atlet Renang Sumatera Selatan. Physical Education and Sports, 6(3), 266–271. http://journal.unnes.ac.id/sju/index.php/jpes

Sidik, Dikdik Zafar., dkk. 2019. Pelatihan Kondisi Fisik. Bandung: PT Remaja Rosdakarya.

Sukadiyanto. (2005). Pengantar Teori Dan Melatih Fisik. Yogyakarta: FIK Universitas Negeri Yogyakarta.

Sugiyono. 2018. Metode Penelitian Kuantitatif, Kualitatig, dan R&D, penerbit Alfabeta,Bandung

Susanto, D. A dkk (2023). Pengaruh Latihan *Weighted Vest* dan *Resistence Band* Terhadap Peningkatan *Power* Otot Tungkai Atlet IBA MMA UNDIKMA *CAMP: Journal of Transformation of Mandalika*, 4(2) 160-165.

Tambing, A., Engka, J. N. A., & Wungouw, H. I. S. (2020). Pengaruh Intensitas Latihan Beban terhadap Massa Otot. Jurnal E-Biomedik, 8(1), 1–10. https://doi.org/10.35790/ebm.v8i1.27099.

Wardhana, R. (2013). *Pengaruh Pelatihan Olah Kaki dengan Menggunakan Rompi Pemberat (Weighted Vest) Terhadap Peningkatan Kelincahan pada Usia 14-17 Tahun dwalam Olahraga Bulutangkis*.

Yeni, H. O., Surahman, F., Sanusi, R., & Zulfikri. (2019). Pengaruh Latihan Push-up terhadap Kecepatan Renang gaya Dada 50 Meter Pada Atlet Renang Putra Usia 15-17. Jurnal Pendidikan MINDA, 1(1), 1– 10. http://www.ejurnal.universitaskarimun.ac.id/index.php/mindafkip/article/view/14

Yusup, M., A.,dkk (2021). The Effect of Implementing Interval Method Using Weighted Vest on Power Endurace Abilities Pusaka Angle's Players. *Journal of Sport Science and Education*, 6(1) 9-18.