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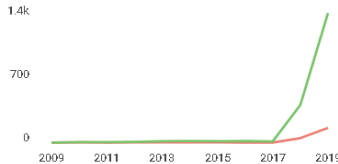
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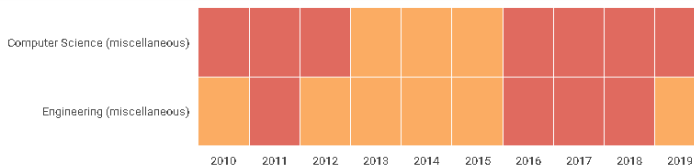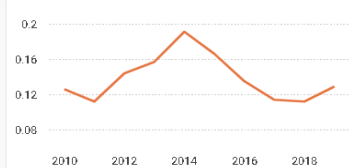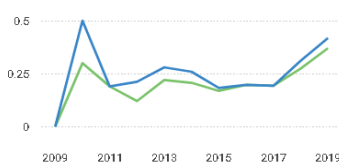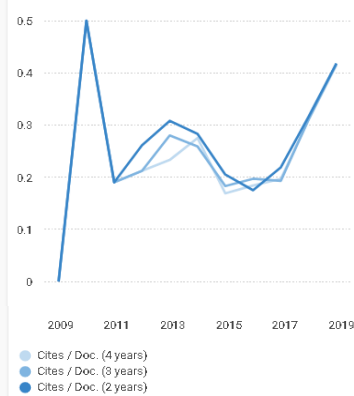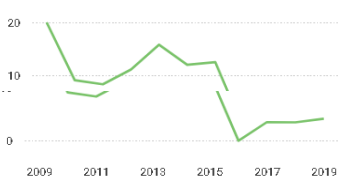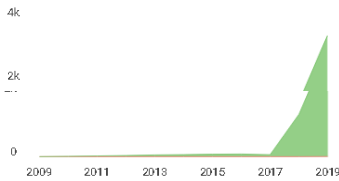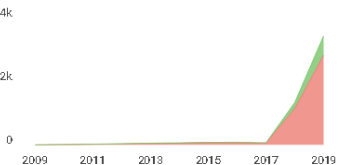
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Profile of Anthropometry and Bio-motor ability of Student Education and Training Center (PPLM) of DKI Jakarta Province (Study of Swimming Athletes)

Abdul Sukur[1], Lordinio A. Vergara[2], JohansyahLubis[3], Fajar Vidya Hartono[4], Jufrianis[5], Heru Sulistianta[6]

[1,3,4]Universitas Negeri Jakarta, Jakarta, Indonesia, Fakulty of Sports Science, East Jakarta, DKI Jakarta 13220, Indonesia.
[2]Philippine Normal University, Department of Physical Education and Sport, 104, Taft Ave, Ermita, Manila, 1000 Metro Manila, Filipina.
[5]UniversitasPahlawan Tuanku Tambusai, Department of Physical Education, Bangkinang, Riau 28412, Indonesia.
[6]Universitas Lampung, Indonesia, Departemen Physical Edcucation, Province Lampung 35153, Indonesia.

Abstract-This research is purposed to find out athlete's bio-motor ability and anthropometry profile of Student Education and Training Center (PPLM) of DKI Jakarta Province especially swimming athletes, such bio-motor ability and anthropometry profile becomes reference to execute student selection in University from achievement program especially in swimming sport. This research used quantitative descriptive method of assessment result on each test which classified in preparing norm of athlete's anthropometry profile and bio-motor ability of Student Education and Training Center (PPLM) of DKI Jakarta Province especially swimming athletes. Research's sample consists of PPLM athletes on swimming sport of 18 athletes. It may be concluded that athlete's anthropometry of PPLM of DKI Jakarta Province average in normal category, male athlete's flexibility bio-motor ability under good category, and female athlete under sufficient category, male athlete's abdomen muscle endurance ability under very less category, and female athlete under sufficient category, shoulder and arm muscle endurance ability of female and male athletes under good category, female athlete's leg explosive power ability under very good category and female athlete under less category, male athlete's aerobic endurance ability under good category and female athlete under sufficient category.

Keywords: PPLM, swimming sport, anthropometry, bio-motor ability

Introduction

Student Education and Training Center (PPLM) of DKI Jakarta Province is one of governmental program which established on 2017. PPLM's program purposed to execute continuous athlete coaching on university student level. This program provide with opportunity for athletes who fail in Regional training center (Pelatda) to be coached as reserve of Pelatda athlete coaching, so benchmarks of PPLM athlete coaching not only to reaches achievement on national or international event tournaments inter university student, but also reaches achievement that comparable to enter into (promotion) program of Pelatda of DKI Jakarta Province. Besides execute continuous athlete coaching on university student level, PPLM also established as one of alternative to execute coaching and development of talented potential student athlete under high interest in sport field to be developed to reach optimal achievement represents the region as well as becomes one of foothold of national athlete supply to represent nation and country in international sport events. Program which run since 2017 has recorded 171 athletes with 19 coaches and 21 caoch assistant as involved. Selection and screening systamwere tightly executed to obtain talented athlete candidates by supporting with facilities, infrastructure, planning, coach and fund procurement to realize optimal resutls.

There are 14 (fourteen) kind of sports which coached in PPLM program, they are athletic, badminton, beach volley, chess, judo, karete, kempo, shooting, petangue, archery, swimming, sepak takraw, martial arts, ping-pong. Athletes as coached in PPLM are expected become the front guard in defending thier region especially DKI Jakarta Province inuniversty student as National Student Sport Week. One sport which dominates in contributing medals is swimming with 12 gold medals, 9 silver medals and 6 bronze medals. Swimming is a competitive sport, one aspect which holds importang role is anthropometry and bio-motor. Research executed by Usnata (2018) under title anthropometry and bio-motor level of volley ball athlete of PBV. Surabaya BayangkaraSamator certified taht

the most important matter to be good volley ball athlete is having high body and fit body condition. While research as executed by Tisna MS (2017) under title anthropometirc profile, leg muscle power, reaction speed, and flexibillity on 100 m's runner certified that in finding 100 m's running athlete candidate is is required to consider physical condition components include anthropometric, leg muscle power, reaction speed, and flexibillity(Hussain et al., 2020). However, research regarding on bio-motor and anthropometry condition of swimming athlete has not made yet therefore researcher made test to find out such data. Physical charateristics have very tight relation wiht body type, such character constitutes one of biological aspects which also stipulates an achievement in sport (Sajoto; 1995). Such bilogoic aspects include body's high and length, body's size and width, and body's shape. Measurement upon such biological aspects by using anthropometry. Anthropometry may be stated as a strudy related to human body dimension measurement. (Masniar, dkk, 2017). Anthropometry measurement includes 1) body's high and weight, factors which cause change in size, weight and anatomy component structure may be any change in gen, hormone, as well as environment and emotional level so excessive body fat may give bad effect to athlete's endurance and performance (Pate,1993) (Bloomfield, 1994). 2) fat percentage, fat shall be the most solid energy source so may be said as the biggest energy source and may be used as energy reserve at training stage (Pate, 1993) (Sunita, 2002). 3). Body Mass Index, limit of body mass index is stipulate by refferring to FAO/HWO provisions, under normal limit for male shall be 20,1-25,0 and for female shall be 18,7-23,8. Indonesian social characteristics which have Asian body type which tends small if compared with type of European countries makes norm modification based on researches in developed contries in Asia it is concluded that bottom limit of body mass index shall be <17,0 and top limit shall be >27,0 (Sutopo, 2001).

Good bio-motoric condition affects psychiatric aspects such as increasing of motivation, spirit and confidence, bio-motoric condition is different for each athlete, it needs a spesific and high test (Tangkudung, 2006) (Bloomfield, 1994). Such abulity test is executed at the begining of preparation which gives general description for coach in implementing exercise program. Bio-motor components consist of power, endurance, explosive power, speed, flexibility, agility, coordiantion, and reaction (Sajoto, 1995). Bio-motor ability aspect which dominate in swmming include: flexibility, explosive power of leg muscle, and endurance ability. Endurance for swimming atlhlete is much dominant due to body is conditioned to be able to work for long period without experiencing excessive fatigue afterward (Harsono, 1988). Good endurance ability affects blood supply capillary process to be run fluently, so energy restoration process on mucsle may run rapidly and recovery process may rapudly run too. Flexibility ability is required for swimming athlete due to flexibility is an ability to move muslce and joints and joint area without any hindrance under good and wide movement range (Michael J. Alter, 2008) (Aroyah, 2009). Leg muscle explosive power is one component of bio-motor which dominant due tue explosive power shall be a power and speed of muscle contraction which dynamic in the most rapid time in executing continoussimiliar movement and made in the short time (Ismaryati, 2008) (Haroon, 1988). Leg muscle is divided into 2 parts namely bottom leg muscle and top leg muscle, top leg muscle consists of: abductor maldanus, abductor brevis, abductor longus, rectur femoris, vastus lateralis external, vestus medialis internal, vastus inters medial, bisep femoris, semi membranosus, semi tendinosus, Sartorius. Bottom leg muscle consist of: tibialis anterior, ekstensor tangles longus, popliteus, falangus longus, tibialis posterior, ekstensorfalangus. (Syaifudin, 1997). Leg muscle ability owned by swimmer depends on muscle contraction intencity shall be muscle ability to contracts to move, explode all power from thigh to the bottom maximaly in short time after receive a stimulation.

Method

This research type is quantitative descriptive research which each test result measurement will be classified into norms to prepare data of PPLM athlete's anthropomtry and bio-motor ability especially swimming. Sample was decided under total sampling method of 18 athletes of swimming of PPLM of DKI Jakarta Province, they were researched their bio-motoric ability as well as their anthropometry data. Anthropometry measurementinstrumen used Body Mass Index (BMI) method. BMI instrument was measured by using microtoa under centimeter (cm) scale for body high and body weight measurement used a scale with kilogram (kg) scale, in defining anthropometry score was used BMI calculation method by using a formula Body Weight divided by quadrate Body High. Calculation result of BMI is defined by using below norm

Tabel 1: Body Mass Index (BMI) Norm Table

	Category	BMI
Thin	Body weight lack in heavy level	< 17,0
	Body weight lack in lite level	17,0 – 18,4
Normal	Ideal	18,5 – 25,0
Fat	Body weight excess in lite level	25,1 – 27,0

Body weight excess in heavy level	> 27,0

(Sutopo:2001)

Ability measurement of bio-motoric components for flexibility predominant component used sit & reach component, predominant component of abdomen muscle endurance used instrument of 2 minutes sit-up test, predominant component of arm and shloulder muscle endurance used instrument of one minute push-up, predominan component of leg muscle explosive endurance used instrument of standing board jump, predominan component of aerobic endurance used instrument of cardiopulmunary exercise test or CPET which executed in laboratory. Result of bio-motoric ability measurement used Brianmac (brianmac.co.uk) norm as follows:

Bio-motor component	Very Good		Good		Suffi-cient		Less		Very Less	
	Male	Female	Male	FeMale	Male	Femal e	Male	Female	Male	Femae
Flexibility	>28	>35	21-28	28-34	14-20	21-27	8-13	14-20	>8	<14
Abdomen Muscle Endurance	>98	>78	89-98	69-78	79-88	59-68	69-78	49-58	<69	<49
Arm andShloulder Muscle Endurance	>50	>38	41-50	28-35	33-40	21-27	25-32	13-20	<25	>13
Leg Muscle Explosive Endurance	>2,25	>2,1	2,14-2,25	1,9-2,1	2,03-2,13	1,7-1,8	1,70-2,02	1,5-1,7	<1,70	<1,5
Aerobic Endurance	>55	>40	51-55	39-40	45-50	35-38	38-44	31-34	<38	<31

(brianmac.co.uk)

Result and Discussion
Result
Physiological Physical Characteristic of Research Subject

Data description regarding on Physiological Physical Characteristic of Research Subject is purposed to provide with general description regarding on data as age (years), body high (cm's), body weight (kg's), resting pulse (bpm's), systole and diastole blood pressure (mmHg) and lactate acid level when resting (mmol/l) as drawn up in below table.

Table of Physiological Physical Characteristic of Research Subject

Physiological Characteristic	Gender	S	X	±	Med	Min	Max
Age (Years)	Male	7	19,86	±	1,57	17	22
	Female	9	19,56	±	1,24	18,00	22,00
Body High (Cm's)	Male	7	169,69	±	5,21	164,50	180,50
	Female	9	159,44	±	5,74	151,50	168,50
Body Weight (Kg's)	Male	7	69,97	±	6,29	61,00	80,10
	Female	9	57,89	±	2,70	54,00	62,50
Resting Pulse (Bpm's)	Male	7	69,00	±	12,37	50,00	83,00
	Female	9	71,67	±	9,25	55,00	87,00
Systole (mmHg)	Male	7	120,00	±	8,16	110,00	130,00
	Female	9	103,89	±	9,28	90,00	120,00
Diastole (mmHg)	Male	7	74,29	±	7,87	60,00	80,00
	Female	9	73,33	±	5,00	70,00	80,00

Lactate Acid Level When Resting (mmol/l)	Male	7	2,84	±	0,45	2,20	3,60
	Female	9	3,87	±	1,39	1,80	6,10
Lactate Acid Level When in Maximum Physical Work	Male	7	15,24	±	4,23	7,60	21,00
(mmol/l)	Female	9	12,72	±	2,48	9,30	16,40

Further to find out swimming athlete's anthropometry profile and bio-motor ability of PPLM of DKI Jakarta Province, data of research result then be classified into categories to show general description regarding on swimming athlete's anthropometry profile and bio-motor ability of PPLM of DKI Jakarta Province.

Swimming Athlete's Anthropometry of PPLM of DKI Jakarta Province

Anthropometry relates to proportion of athlete's body high and weight. Based on data of research result, data description regarding on components of Body High (cm's), Body Weight (Kg's) and Body Mass Index (Kg/cm2) may be shown in below table.

Table of Swimming Athlete's Anthropometry of PPLM of DKI Jakarta Province

Anthropometry	Gender	S	X	±	Med	Min	Max
Body High (cm's)	Male	7	169,69	±	5,21	164,50	180,50
	Female	9	159,44	±	5,74	151,50	168,50
Body Weight (Kg's)	Male	7	69,97	±	6,29	61,00	80,10
	Female	9	57,89	±	2,70	54,00	62,50
	Female	9	73,33	±	5,00	70,00	80,00
Body Mass Index (Kg/cm2)	Male	7	24,36	±	2,64	21,16	28,21
	Female	9	22,82	±	1,60	20,78	25,05

Further to find out swimming athlete's anthropometry profile of PPLM of DKI Jakarta Province, Body Mass Index (BMI) obtained from result of calculation of body high and weight is classified into categories in accordance with obtained score as shown in below table:

Table of Swimming Athlete's Body Mass Index (BMI) of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Under Weight	>18	0	0,00
Normal	18-24,9	13	81,25
Over Weight	25-30	3	18,75
Obese	>30	0	0,00
Total		16	100,00

Swimming Athlete's Bio-Motor Component of PPLM of DKI Jakarta Province

Profile of Swimming Athlete's Bio-Motor Ability of PPLM constitutes general description regarding on athlete's bio-motor ability capacity on muscle which is predominant used when fighting. Description regarding on predominant bio-motor capacity on swimming athlete includes; Flexibility, Abdomen Muscle Endurance, Arm and Shloulder Muscle Endurance, Leg Muscle Endurance and Heart and Lung Endurance may be shown on below table:

Table of Swimming Athlete's Bio-Motor Component of PPLM of DKI Jakarta Province

Motor Component	Gender	S	X	±	Med	Min	Max
Flexibility	Male	7	25,79	±	6,01	20,00	36,00
	Female	9	21,83	±	7,52	13,00	35,00
Abdomen Muscle Endurance	Male	7	67,43	±	8,98	53,00	77,00
	Female	9	58,00	±	11,87	42,00	76,00

Arm and Shloulder Muscle Endurance	Male	7	46,00	±	12,41	32,00	63,00
	Female	9	30,00	±	10,00	12,00	45,00
Leg Muscle Endurance	Male	7	226,43	±	21,16	190,00	250,00
	Female	9	165,00	±	21,20	136,00	190,00
Heart and Lung Endurance	Male	7	51,71	±	6,56	43,10	61,20
	Female	9	38,10	±	6,05	31,80	51,10

Further to find out each bio-motor component profile, test result of bio-motor ability is categorized pursuant to achieved score;

Swimming Athlete's Flexibility of PPLM of DKI Jakarta Province

Flexibility profile of Swimming Athlete of PPLM constitutes general description regarding on athlete flexibility capacity on predominant muscles used when fighting. Based on score of muscle flexibility test result used Sit & Reach instrument then such score is categorized pursuant to test norm categories as shown on below table:

Table of Male Swimming Athlete's Flexibility of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	>8	0	0,00
Less	8-13	0	0,00
Sufficient	14-20	1	14,29
Good	21-28	4	57,14
Very Good	>28	2	28,57
Total		7	100,00

Table of Female Swimming Athlete's Flexibility of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	<14	2	22,22
Less	14-20	2	22,22
Sufficient	21-27	3	33,33
Good	28-34	2	22,22
Very Good	>35	0	0,00
Total		9	100,00

Swimming Athlete's Abdomen Muscle Endurance of PPLM of DKI Jakarta Province

Profile of Swimming Athlete's Abdomen Muscle Endurance of PPLM constitutes general description regarding on muscle endurance capacity which is predominant used when fighting. Based on score of test result of abdomen muscle endurance using sit up 2 minutes (two minutes sit up) instrument then such score be categorized based on test norm category as shown on below table:

Table of Male Swimming Athlete's Abdomen Muscle Endurance of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	<69	4	57,14
Less	69-78	3	42,86
Sufficient	79-88	0	0,00
Good	89-98	0	0,00
Very Good	>98	0	0,00
Total		7	100,00

Profile of Anthropometry and Bio-motor ability of Student Education and Training Center (PPLM) of DKI Jakarta Province
(Study of Swimming Athletes)

Table of Female Swimming Athlete's Abdomen Muscle Endurance of PPLM ofDKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	<49	3	33,33
Less	49-58	2	22,22
Sufficient	59-68	2	22,22
Good	69-78	2	22,22
Very Good	>78	0	0,00
Total		9	100,00

Swimming Athlete's Arm and Shloulder Muscle Endurance of PPLM of DKI Jakarta Province
Profile of Swimming Athlete's Arm and Shloulder Muscle Endurance of PPLM constitutes general description regarding on muscle endurance capacity which is predominant used when fighting. Based on score of test result of arm and shloulder muscle endurance using 1 minute push upt (sixty seconds push up) instrument then such score be categorized based on test norm category as shown on below table:

Table of Male Swimming Athlete's Arm and Shloulder Muscle Endurance of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	<25	0	0,00
Less	25-32	1	14,29
Sufficient	33-40	2	28,57
Good	41-50	1	14,29
Very Good	>50	3	42,86
Total			100,00

Table of Female Swimming Athlete's Arm and Shloulder Muscle Endurance of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	>13	1	11,11
Less	13-20	0	0,00
Sufficient	21-27	3	33,33
Good	28-35	3	33,33
Very Good	>38	2	22,22
Total		9	100,00

Profile of Swimming Athlete's Leg Muscle Power of PPLM of DKI Jakarta Province
Profile of Swimming Athlete's Leg MuscleExplosive Power PPLM constitutes general description regarding on muscle endurance capacity which is predominant used when fighting. Based on score of test result of leg muscle endurance using standing board jump instrument then such score be categorized based on test norm category as shown on below table:

Table of Male Swimming Athlete's Leg Muscle Power of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	<1,70	0	0,00
Less	1,70-2,02	1	14,29
Sufficient	2,03-2,13	0	0,00
Good	2,14-2,25	3	42,86
Very Good	>2,25	3	42,86

			100,00
Total			

Table of Female Swimming Athlete's Leg Muscle Power of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	<1,5	2	22,22
Less	1,5-1,17	3	33,33
Sufficient	1,7-1,8	3	33,33
Good	1,9-2,1	0	0,00
Very Good	>2,1	1	11,11
Total		9	100,00

Profile of Swimming Athlete's Heart and Lung Endurance of PPLM of DKI Jakarta Province
   Profile of Swimming Athlete's Heart and Lung Endurance of PPLM constitutes general description regarding on muscle endurance capacity which is predominant used when fighting. Based on score of test result of heart and lung endurance using Cardiopulmonary Exercise Testing (CPET) instrument then such score be categorized based on test norm category as shown on below 4.13 table:
   Table of Profile of Male Swimming Athlete's Heart and Lung Endurance of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	<38	1	14,29
Less	38-44	0	0,00
Sufficient	45-50	3	42,86
Good	51-55	1	14,29
Very Good	>55	2	28,57
Total			100,00

Table of Profile of Female Swimming Athlete's Heart and Lung Endurance of PPLM of DKI Jakarta Province

Category	Score	Number	Percentage (%)
Very Less	<31	0	0,00
Less	31-34	2	22,22
Sufficient	35-38	4	44,44
Good	39-40	1	11,11
Very Good	>40	2	22,22
Total		9	100,00

Discussion
   Body Mass Index is one of Anthropometry component which has special concern in swimming athlete development to reach achievement. As previously discussed, ideal body shape is enable athlete in exercising motions when performing training or in fighting. Based on calculation result of Body Mass Index (BMI) it may find out that there are 13 athletes (81,25%) have normal category, while 3 athletes (18,75%) have overweight category with average of Body Mass Index for male and female athletes under normal category (24,36 ± 2,64) and (22,82 ± 1,60). Related to such matter it is may comprehended that 3 athletes under overweight category becomes coach's concern to effort to decrease athlete's body weight to reach normal category trough exercise program which is purposed to decrease body weight.
   Predominant bio-motor components on swimming athlete include flexibility capacity, abdomen muscle endurance, arm and shoulder muscle endurance, leg muscle power, and heart and lung endurance. Flexibility constitute one of bio-motor component which describes muscle ability to stretch according to Range Of Motion (ROM), good muscle flexibility help athlete in performing motion when fighting and eliminate occurrence of injury

risk. Based on research result average of male swimming athlete capacity is under good category ($25,79 \pm 6,01$) and female athlete is under sufficient category ($21,83 \pm 7,52$).

Besides flexibility, local muscle endurance capacity which includes abdomen muscle endurance and arm and shoulder muscle endurance constitute bio-motor capacity which have role in producing continuous energy during fighting. Based on research it is found that average of abdomen muscle endurance ability belongs to male athlete has very less category ($67,43 \pm 8,98$) and female athlete has sufficient category ($58,00 \pm 11,87$). On arm and shoulder muscle endurance capacity it is found that average male athlete has good category ($46,00 \pm 12,41$) and female athlete has good category ($30,00 \pm 10,00$).

Leg muscle explosive power constitutes one of bio-motor component which has role to help athlete's speed when fighting. This bio-motor component provides with a push in water trough explosive power produced from leg muscle. Based on research it is found that average of male athlete's leg muscle explosive power has very good category ($2,26 \pm 21,16$) and female athlete has less category ($1,65 \pm 21,20$).

Beside bio-motor components as aforesaid, heart and lung endurance capacity constitute component which has role in maintaining oxygen supply while athlete is performing physical work when fighting. Based on research it is found that average male athlete has good category ($51,71 \pm 6,56$) and female athlete has sufficient category ($38,10 \pm 6,05$).

Conclusion

Based on research it concluded as follows;

1. Male and female Swimming Athlete's anthropometry of PPLM of DKI Jakarta Province in average has normal category ($24,36 \pm 2,64$) and ($22,82 \pm 1,60$)
2. Athlete's bio-motor ability of PPLM of DKI Jakarta Province;
    a. Flexibility capacity; in average male athlete's capacity has good category ($25,79 \pm 6,01$) and female athlete has sufficient category ($21,83 \pm 7,52$)
    b. Abdomen muscle endurance capacity; in average male athlete's capacity has very less category ($67,43 \pm 8,98$) and female athlete has sufficient category ($58,00 \pm 11,87$).
    c. Arm and shoulder muscle endurance capacity; in average male athlete's capacity has good category ($46,00 \pm 12,41$) and female athlete has good category ($30,00 \pm 10,00$).
    d. Leg muscle explosive power capacity; in average male athlete's capacity has very good category ($2,26 \pm 21,16$) and female athlete has less category ($1,65 \pm 21,20$).
    e. Heart and lung endurance capacity; in average male athlete's capacity has good category ($51,71 \pm 6,56$) and female athlete has sufficient category ($38,10 \pm 6,05$)

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