



Available online at:

<https://ejournal.upi.edu/index.php/penjas/article/view/23792>DOI: <https://doi.org/10.17509/jpjo.v5i1.23792>

A Predominant Physical Component Profile of Persipura Junior Football Athletes

Daniel Womsiwor^{1*}, N Adiputra¹, I Made Bakta¹, Ambrosius Purba², I Made Jawi¹, I Ketut Suyasa¹, Nita Fitri³

¹Program Studi Doktor Ilmu Kedokteran Konsentrasi Fisiologi Olahraga, Universitas Udayana

²Departemen Ilmu Kedokteran, Fakultas Kedokteran, Universitas Padjadjaran Bandung

³Departemen Keperawatan Dasar, Fakultas Keperawatan, Universitas Padjadjaran, Bandung

Article Info

Article History :

Received December 2019

Revised December 2019

Accepted February 2020

Available online April 2020

Keywords :

Football athlete, PERSIPURA junior,
Predominant physical component

Abstrak

Penelitian ini bertujuan untuk mengidentifikasi Profil Komponen Fisik Predominan (Kebugaran Jasmani, Ketebalan Lemak, Kelincahan, Daya Tahan Otot, Kelentukan, Daya Ledak Otot, Kekuatan Otot dan Keseimbangan) Atlet Pemain Sepak Bola Persipura Junior. Penelitian ini menggunakan survei terhadap atlet Sepak Bola PERSIPURA Junior sebanyak 39 orang, yang memiliki inklusi: jenis kelamin laki-laki, umur 21 tahun, tinggi badan 177 cm, berat badan ideal, berbadan sehat dan kebugaran fisik dengan kategori sedang sampai kategori baik. Instrumen untuk mengukur kekuatan otot dengan dinamometer; daya tahan otot diukur dengan sit-up, push-up, squat jumps; kelincahan diukur dengan beam side step, kelentukan diukur dengan fleksometer, daya ledak otot diukur dengan vertical jump, dan kebugaran jasmani diukur dengan tes lari 2,4 km. Hasil Penelitian menunjukkan atlet Pemain Sepak Bola Persipura Junior memiliki kebugaran jasmani baik, ketebalan lemak triceps kurang, ketebalan sub scapula normal, ketebalan supra iliaca normal, kelincahan kurang, daya tahan otot lengan dan bahu baik sekali, daya tahan otot perut baik, kelentukan cukup, daya ledak otot vertical jump sempurna, daya ledak otot medicine ball baik, kekuatan otot full baik, kekuatan otot push kurang, keseimbangan baik sekali. Agar komponen fisik predominan optimal, hendaknya menerapkan sports science dengan latihan terukur dan terprogram dengan baik sehingga komponen fisik ketebalan lemak triceps, kelincahan dan kekuatan otot push meningkat

Abstract

This study was aimed at determining the description of the predominant physical component profile (physical fitness, fat thickness, agility, muscle endurance, flexibility, power, muscle strength and balance) of the Persipura Junior football athletes. This study used a survey of Persipura Junior football athletes involving 39 people. The inclusions of the athletes include male gender, aged 21 years, height 177cm, an ideal body weight, a healthy body, and moderate to good categories of physical fitness. The instruments used in this study were dynamometer for muscle strength; crunches for muscular endurance, push-ups, squat jumps, and beam side step for agility, flexometer for flexibility, vertical jump for power, and 2.4 km running test for physical fitness. The results showed that the Persipura Junior football athletes had a good physical fitness, less triceps fat thickness, a normal sub scapular thickness, a normal supra iliaca thickness, lack of agility, a good endurance of arm and shoulder muscles, a good endurance of abdominal muscles, an adequate flexibility, a perfect vertical jump muscle power, a good medicine ball muscle explosive power, a good full muscle strength, lack of push muscle strength, and a very good balance. It concludes that to gain an optimal predominant physical component, sports science with measurable and well-programmed exercises should be applied, so that the physical component of triceps fat thickness, agility, and push muscle strength could increase.

INTRODUCTION

Football games, by considering its characteristics and basic movements, is a game requiring body movements supported by a good motor skill to gain a good achievement (Bujnovky et al., 2019). The athlete performance in football games could be optimized by increasing their predominant physical components that are specifically needed for football games, including physical fitness, fat thickness, agility, muscle endurance, flexibility, power, muscle strength and balance of the athlete (Kenney, Larry, W., Wilmore, Jack, Costill, & David, 2011).

The predominant physical components of football athlete is crucial during moving, running, jumping or leaping. The specific predominant physical component ability for football athlete is trained in the special preparation stage of the training program periodization (Kurniawan, R., & Elfarabi, A, 2018).

Concerning the achievement development of Indonesia football athletes, especially football athletes of PERSIPURA in Papua Province, they have not gained a maximum achievement for the last 50 years. Furthermore, the football athletes of Persipura Junior (PERSIPURA Junior Football Athletes U-21) have not won the championship. According to the observation of some trainers and sport experts, the lack of achievement of the junior athletes might be caused by the absence of Sport Science implementation during the Periodical Training Program. Moreover, previous research conducted by Arjuna (2018), related to the predominant physical component profile, it still focuses on the trainers, thus it had not been able to see the predominant physical component of the athlete as the player who will do the tournament. Therefore, this research was aimed at studying the predominant physical component profile (physical fitness, fat thickness, agility, muscle endurance, flexibility, power, muscle strength and balance) of Persipura Junior Football Athletes.

METHODS

Design

This research is a survey research (Sugiyono, 2012). The research variable measurement was conducted after the PERSIPURA Junior Football athletes

conducted two month training in the special training stage of the training program periodization. The research variables include muscle strength, measured by dynamometer; muscle endurance, measured by sit-up, push-up, squat jumps, agility, measured by beam side step, flexibility, measured by fleksometer, muscle explosive power, measured by vertical jump, and physical fitness, measured by 2,4 km running test. The data analysis was processed by percentage calculation.

Population and Sample

The population target of this study were all 114 PERSIPURA Junior football athletes. The subjects of the study were chosen randomly by considering the inclusion and exclusion criteria. The inclusion criteria include male gender, aged 21 years, height 177cm, an ideal body weight, healthy, and moderate to good physical fitness category. The exclusion criteria include the subject refused to follow the procedure of the research and had health problems. According to the size of the sample calculation, the number of the sample of this study were 39 persons.

Data Collection Technique

The procedure and the technique of the data collection were started by giving explanation verbally and through a written informed consent to all the 114 PERSIPURA Junior football athletes. When the PERSIPURA Junior football athletes had agreed the research procedure, the agreement form was signed. The researcher then conducted an interview to gain information and to confirm the demography data of the athletes which include the age, gender, educational background, medical history, and medical treatment history.

The research was started by selecting the PERSIPURA Junior football athletes through a purposive sampling technique. The PERSIPURA Junior football athletes, who signed the informed consent, then followed the muscle strength test by using dynamometer; muscle endurance was measured by sit-up, push-up, squat jumps; agility was measured by beam side step; flexibility was measured by flexometer; muscle explosive power was measured by vertical jump; and physical fitness was measured by 2.4km running test.

Data Analysis

The design of data analysis was processed by IBM SPSS version 23.0 started by testing the normality of the data by using Shapiro-Wilk ($p \geq 0,05$) to find out whether the data of the predominant physical components normally distributed or not. Shapiro Wilk test was taken as the number of samples were less than 50. The data analysis was conducted by using the frequency distribution of the predominant physical components.

RESULT

The findings of the study related to the predominant physical component, including physical fitness, fat thickness, agility, muscle endurance, flexibility, power, muscle strength and balance, of the Persipura Junior Football athletes from Persipura Jayapura are as follow:

Table 1. The Persipura Junior Football Athlete Physical Fitness

No	Physical Fitness Level	f	%
1	Good	29	74,36
2	Fair	10	25,64
3	Poor	0	0
Total		39	100

According to the table 1, based on the 2.4km running test, the physical fitness of the most of the Persipura Junior Football athletes, 29 persons (74,36%), were at the good physical fitness level.

Table 2. Fat Thickness of Sub Scapula and Supra Iliaca of the Persipura Junior Football Athletes

No	Sub Scapula Fat Thickness		Supra Iliac Fat Thickness			
	f	%	f	%		
1	Normal	35	89,74	Normal	25	64,10
2	Adequate	4	10,26	Fair	14	35,90
3	Low	0	00,00	Low	0	00,00
Total		39	100,00	Total	39	100,00

According to the table 2, related to sub scapula fat thickness, most of the Persipura Junior Football athlete, 35 persons (89,74%), had a normal sub scapula fat thickness. Besides that, the fat thickness of the supra iliac of most of the athletes, 35 persons (89,74%) was normal.

Table 3. The Agility of the Persipura Junior Football Athletes

No	Agility	f	%
1	Normal	0	0
2	Fair	0	0
3	Poor	39	100
Total		39	100

Table 3 shows that the agility of all of the Persipura Junior football athletes, 39 persons (100,00%), was in the poor category.

Table 4. The Endurance of Arm, Shoulder, and Abdominal Muscles of the Persipura Junior Football Athletes

No	Arm and Shoulder Muscle Endurance		Abdominal Muscle Endurance			
	f	%	f	%		
1	Perfect	11	28,21	Perfect	0	00,00
2	Very Good	17	43,59	Very Good	1	02,56
3	Good	10	25,64	Good	34	61,54
4	Fair	1	02,56	Fair	14	35,9
5	Poor	0	00,00	Poor	0	00,00
Total		39	100,0	Total	39	100,0

Table 4 presents that the endurance of the arm and shoulder muscles of almost half of the Persipura Junior football athletes, 17 persons (43,59%), was very good. Moreover, more than half of the Persipura Junior football athletes, 34 persons (61,54%), had a good abdominal muscle endurance.

Table 5. The Flexibility of the Persipura Junior Football Athletes

No	Flexibility	f	%
1	Very Good	5	12,82
2	Good	10	25,64
3	Fair	17	43,59
4	Poor	7	17,95
Total		39	100

The table 5 depicts that the flexibility of almost half of the Persipura Junior football athletes, 17 persons (43,59%), was in the fair category.

Table 6. The Muscle Explosive Power (Vertical Jump and Medicine Ball) of the Persipura Junior Football Athletes

No	Muscle Explosive Power (Vertical Jump)	f	%	Muscle Explosive Power (Medicine Ball)	f	%
1	Perfect	19	48,72	Perfect	1	2,56
2	Very Good	4	10,26	Very Good	0	0
3	Good	2	5,13	Good	19	48,72
4	Fair	1	2,56	Fair	19	48,72
5	Poor	13	33,33	Poor	0	0
Total		39	100	Total	39	100

According to the table 6, the muscle explosive power (vertical jump) of almost half of the Persipura Junior football athletes, 19 persons (48,72%), was perfect. Moreover, almost half of the Persipura Junior football athletes, 19 persons (48,72 %), had a good muscle explosive power (medicine ball) and also almost half of the athletes, had a fair muscle explosive power.

Table 7. The Muscle Power (Pull and Push) of the Persipura Junior Football Athletes

No	Muscle Power (Pull)	f	%	Muscle Power (push)	f	%
1	Perfect	1	2,56	Perfect	0	00,00
2	Very Good	7	17,95	Very Good	1	2,56
3	Good	14	35,90	Good	6	15,38
4	Fair	10	25,64	Fair	8	20,51
5	Poor	7	17,95	Poor	24	61,54
Total		39	100,00	Total	39	100,00

Table 8. The Power of Back Muscle and Limb Muscles of the Persipura Junior Football Athletes

No	Back Muscle Power	f	%	Limb Muscle Power	f	%
1	Perfect	2	5,13	Perfect	0	00,00
2	Very Good	8	20,51	Very Good	1	2,56
3	Good	19	48,72	Good	9	23,08
4	Fair	10	25,64	Fair	15	38,46
5	Poor	0	00,00	Poor	14	35,9
Total		39	100,00	Total	39	100,00

The table 7 shows that a small number of the Persipura Junior football athletes, 14 persons (35,90%), had a good muscle power (full). In addition, more than half of them, 24 persons (61,54), had a poor muscle power (push).

Table 8 presents that almost half of the Persipura Junior football athletes, 19 persons (48,72 %), had a good back muscle power. In addition, a small number of them, 15 persons (38,46 %), had a fair limb muscle power.

Table 9. Balance of the Persipura Junior Football Athletes

No	Physical Fitness Level	f	%
1	Excellent	0	00,00
2	Very Good	35	89,74
3	Good	2	5,13
4	Fair	1	2,56
5	Poor	1	2,56
Total		39	100,00

According to table 9, the balance of most of the Persipura Junior football athletes, 35 persons (89,74 %), was very good.

DISCUSSION

Physical Fitness

The cardiorespiratory endurance (VO₂Max) is the capability to do daily activities vigorously and consciously without a significant exhaustion. The cardiorespiratory endurance is involved in the capability of cardiorespiratory system and blood vessel to function optimally in both resting state and during doing activities (Chung, Baguet, Bex, Bishop, & Derave, 2014).

The cardiorespiratory endurance is the capability in maintaining the activity of the body for a range of time measured by VO₂Max. VO₂Max is defined as the capability of using or consuming the highest oxygen taken by a person during physical activity by breathing the air on the sea level. A person with a good physical condition or with a good physical fitness would have a higher VO₂Max value than those who have a poor physical fitness (Zanco et al, 2016).

The result of the study shows that according to the 2.4km running test, the physical fitness of the most of Persipura Junior football athletes, 29 persons (74,36%), was good. The result of the study of 24 PERSIPASI Bekasi men football athletes shows that the average of their aerob endurance was 6.41 that is categorized as fair (Hermanto, 2014). The research of 22 football athletes of the Indonesia Lumajang Football Association,

measuring VO₂Max through Multistage Fitness Test (MFT), shows that the average of the VO₂Max level of the athletes was 49,02ml/kgBB/min that is included in the good category (Septian dan Agung, 2013).

Another research was conducted by Arjuna (2018) on 11 trainers of SSO Real Madrid FC FIK UNY measuring predominant physical components, including general endurance (cardiovascular), by using the multistage test. The result shows that the cardiovascular endurance was 33,67 ml.kg/min that shows a poor cardiovascular endurance.

Fat Thickness

The thickness of fat of the athlete has an important role in affecting the physical fitness level of the athletes. The higher the fat thickness, the higher the risk problem of the blood stream in the capillary. It would have an effect on the oxygen supply and nutrition to the muscle. This condition will affect the muscle power (Kenney, Larry, W., Wilmore, Jack, Costill, & David, 2011).

The result of the study shows that the tricep fat thickness of the most of the Persipura Junior athletes, 32 persons (82,05%), is in low category. Meanwhile, the fat thickness of the sub scapula of the most of the athletes, 35 persons (89,74%), was normal, while the supra illiac fat thickness of most of the athletes, 35 persons (89,74%), was normal.

Agility

Agility is a person's ability to change the direction quickly and accurately without losing balance (Kenney, Larry, W., Wilmore, Jack, Costill, & David, 2011). In football games, agility is an important physical component. Agility is important to be acquired by the athletes as it is related to the improvement of the movement ability and skills during dribbling the ball, kicking the ball, and running back and forth rapidly during the training and tournament (Bujnovky, et al., 2019).

The result of the study shows that the agility of all of the Persipura Junior football athletes, 39 persons (100,00%) was in the poor category. The result of the study of football athletes aged 13 year old in the Jaten football school shows that the agility ladder exercise through lateral run method had an impact on the improvement of running agility of the athlete for 34,5% (p

-value 0,012 (p < 0,05) (Apriyadi, Rosella, Santoso, 2014). Another research conducted by Hermanto (2014) on 24 football athletes of PERSIPASI Bekasi shows that the average flexibility of athletes was 3.16 (poor category).

Local Muscle Endurance

The local muscle endurance is the ability or the capacity of a group of muscles to do contraction repeatedly against a certain load or to maintain the contraction in a long term of time. The local muscle endurance has a close relationship with the emergence of muscle fatigue (Kenney, Larry, W., Wilmore, Jack, Costill, & David, 2011).

Muscle endurance is needed to conduct the activity that is dominated by the use of muscle or a group of muscles, such as during the training or football tournament. The muscle endurance that is important for the football athletes includes the abdominal muscle endurance, arm and shoulder muscle endurance, and limb muscle endurance (Bujnovky, et al., 2019).

The result of the study shows that the arm and shoulder muscle endurance of almost half of the Persipura Junior football athletes, 17 persons (43,59%), was very good and the abdominal muscle endurance of more than half of them, 34 persons (61,54 %), was good. The research of Arjuna (2018) on 11 trainers of the SSO Real Madrid FC FIK UNY measured predominant physical components including the muscle endurance. The result of the study shows that the abdominal muscle endurance of more than half of the participants, 7 persons (63,6%), was fair; the arm and shoulder muscle endurance of almost half of them, 4 persons (36,4%) was good; and limb endurance of almost all of them, 10 persons (90,9%), was poor.

Flexibility

Kenney, Larry, W., Wilmore, Jack, Costill, & David (2011) state that flexibility is the capability of joints to do a range of movement maximally. The flexibility is limited by the bone structure, muscle elasticity, tendon, ligament, and skin.

Flexibility is one of physical components that becomes an important factor in almost all of human movements, especially movements in sports. The problems in flexibility could decrease the athlete perfor-

mance (The FA, 2015; Sport England, 2018).

The result of the study shows that the flexibility of almost half of the Persipura Junior football athletes, 17 persons (43,59%), was fair. The result of the study of 24 men football athletes of PERSIPASI Bekasi shows that they had average score of flexibility 3.16 that falls in the poor category (Hermanto, 2014).

Muscle Explosive Power

The muscle explosive power is the ability of the muscle to resolve the resistance by doing a rapid contraction. The muscle explosive power is the combination of the muscle power and rapidity. The rapidity is the ability to do a similar or different movement in a short of time (Kenney, Larry, W., Wilmore, Jack, Costill, & David, 2011).

The muscle explosive power is one of physical components needed by almost all of type of sport, especially football that requires explosive power when running or kicking the ball. Rapidity in football includes chasing the ball from the back to the front, then quickly moving backward, moving to the left, moving to the right, going back to the center of the field, and dribbling and kicking the ball (Bujnovky, et al., 2019).

The success of a football player in tournament is caused by the ability in coordinating an explosive movement. To improve the muscle explosive power, the improvement of power and rapidity are required at the same time (The FA, 2015; Sport England, 2018).

The result of the study shows that the muscle explosive power (vertical jump) of almost half of the Persipura Junior football athletes, 19 persons (48,72%), was perfect and the muscle explosive power (medicine ball) of almost half of them, 19 persons (48,72 %), was good and other 19 persons (48,72 %) had a fair muscle explosive power.

The result of the research of 24 men football athletes of the PERSIPASI Bekasi shows that the average score of the muscle explosive power was 8.25 or in the good category (Hemanto,2014). Another research was conducted by Argantos (2018) on 23 persons, all of the football athletes of West Sumatera. The result of the study related to the limb muscle explosive power using vertical jump instrument shows that the muscle explosive power of the men athlete of PERSIPASI was poor.

The research on 11 trainers of the SSO Real Madrid FC FIK UNY measuring the muscle explosive power shows that the average score of vertical jump was 45,8 cm, which means that the trainers of the SSO Real Madrid FC had a fair power.

Muscle Power

The muscle power is the ability of muscle or a group of muscles in doing contraction maximally against the resistance or load. Muscles have abilities to adapt on the given load. The muscle power can be improved by adding the load that works on the intended muscle. The physiological changes happen during the improvement of the muscle power named muscle hypertrophy. Hypertrophy of muscle happens as the result of the increase of the muscle fiber and diameter of the muscle fibers (Kenney, Larry, W., Wilmore, Jack, Costill, & David, 2011).

Muscle power is the foundation of all basic physical components of football athletes, including the power of the arm and shoulder muscles, back muscle, and limb muscle. The muscle power can help strengthening the joint stability, thus the football athletes owning a good muscle power will not easily get injured. In football sport, muscle power is highly required, such as for kicking the ball and dribbling the ball (Bujnovky, et al., 2019).

The result of the research shows that a small number of the Persipura Junior football athletes, 14 persons (35,90%), had a good muscle power (full) and more than half of them, 24 persons (61,54 %), had a poor muscle power (push).

The result of the study shows that almost half of the Persipura Junior football athletes, 19 persons (48,72 %), had a good back muscle power and small number of them, 15 persons (38,46 %), had a fair limb muscle power.

The research of Argantos (2018) on all football athletes of PPLP West Sumatera (23 persons) shows that their abdominal muscle power, through sit up measurement for 30 seconds, was poor.

Another research conducted by Arjuna (2018), using the leg and back dynamometer for measuring back muscle power, shows that almost half of the participants, 5 persons (45,5%), had a very good back mus-

cle power and also almost half of them, 5 persons (45,5%), had a fair limb muscle power.

Balance

Balance is the ability to hold the statical and dynamical body balance when they are placed in various positions. Statical balance is the ability to hold the body position, so that the Center of Gravity (COG) does not change. Dynamical balance is the ability to hold the body balance, hence the COG always changes (Zanco,2016).

Balance is the complex integration of somatosensory system and motor system. Somatosensory system consists of visual, vestibular, and proprioceptive functions. Motor system consists of the ability of the musculoskeletal, joint, and soft tissue of the joints. The brain that manages the balance function includes basal ganglia, cerebellum, and association area (Zanco,2016). For the football athletes, balance is highly needed when kicking and dribbling the ball (Bujnovky, et al., 2019).

The result of the research shows that the balance of most of the Persipura Junior football athletes, 35 persons (89,74 %), was very good. The result of the research of 17 football athletes to see the dynamic balance through One Foot Standing Test shows that the dynamic balance level of the football student athletes of the PPLP South Sulawesi was mostly in the advanced category, especially for the athletes aged 16 year old with normal BMI (Tang, 2014).

CONCLUSION

The result of the study shows that the Persipura Junior football athletes had a good/normal predominant physical condition. To optimize that predominant physical components, the muscle power, agility, and fat thickness of triceps could be improved by applying sports science through a measured and well-programed trainings.

REFERENCES

Apriyadi,I.,Rosella,D.,Santoso,T.B. (2014). Pengaruh Agility Ladder Exercise Dengan Metode Lateral Run Terhadap Peningkatan Kelincahan Lari Pada Atlet Sepakbola Usia 13 Tahun DiSekolah Sepak Bola

- Jaten. Skripsi thesis, Universitas Muhammadiyah Surakarta.
- Argantos dan Hidayat, M. (2018). Hubungan Daya Ledak Otot Tungkai, Kelentukan dan Kekuatan Otot Perut dengan Hasil Lompat jauh Gaya Menggantung. *Menara Ilmu* Vol. XII, No.11 Oktober 2018, ISSN 1693-2617 LPPM UMSBE-ISSN 2528-7613
- Arjuna, F. (2018). Gambaran Komponen Fisik Predominan Pelatih SSO Real Madrid FIK UNY. *Medikora* ,Vol. XVII No. 2 Oktober 2018 - 103 Available online at <https://journal.uny.ac.id/index.php/medikora>
- Bujnovky, D., Maly., T., Ford, K.R., Sugimoto., D., Kunzmann, E., Hank., M., Zahalka, F. (2019). Physical Fitness Characteristics of High-level Youth Football Players: Influence of Playing Position. *Sports*, 7; 46.
- Chung, W., Baguet, A., Bex, T., Bishop, D. J., & Deraeve, W. (2014). *International Journal of Sport Nutrition and Exercise Metabolism*. 24(3), hlm. 315-324.
- Football Association .(2015). Football participation continues to rise in England <http://www.thefa.com/news/2015/jan/29/football-participation-on-rise>. Accessed 10th Mar 2019
- Hermanto, H .(2014). Profil Kondisi Fisik Atlet Sepakbola Persipasi Bekasi S1 thesis, Universitas Pendidikan Indonesia
- Kenney, L.W., Wilmore, J.H., Costill, & David, L. (2011). *Physiology of Sport and Exercise* (5th ed). USA: Human Kinetics.
- Kurniawan, R., & Elfarabi, A. .(2018). Optimalisasi Teknik Recovery untuk Pemain Sepak Bola. *Jurnal Pendidikan Jasmani dan Olahraga*, 3(2), 172-177.
- Kusnanik, N. W., Nasution, J., & Hartanto, S. .2011. *Dasar-Dasar Fisiologi Olahraga*. Surabaya: Unesa University Press.
- Septian,N., Agung, S. (2013). Survei Tingkat Kebugaran Jasmani pada Pemain Persatuan Sepakbola Indonesia Lumajang. *Jurnal Prestasi Olahraga*, vol. 1, no. 1, Feb. 2013.
- Sugiyono. (2012). *Metode Penelitian Kuantitatif Kualitatif dan R&B*. Bandung: Alfabeta.
- Tang, A. (2014). Gambaran Tingkat Keseimbangan Atlet Sepakbola Pusat Pendidikan dan Latihan Olahraga Pelajar Sulawesi Selatan. *Jurnal Ilmiah Kesehatan Diagnosis*, [S.l.], v. 5, n. 1, p. 122-128, aug. 2014. ISSN 2302-1721. Available at: <<http://ejournal.stikesnh.ac.id/index.php/jikd/article/view/735>>. Date accessed: 22 mar. 2020.
- Zanco, M.F., Moraes, H., Maranhão, N.G., Laks, J., Deslandes, A.C.(2019). Assessing cardiorespiratory capacity in older adults with major depression and Alzheimer disease. *J. bras. psiquiatr.* [Internet]. 2016 Mar [cited 2019 June 15]; 65(1): 1-8.