



PROCEEDINGS

THE 1ST YOGYAKARTA INTERNATIONAL SEMINAR ON HEALTH, PHYSICAL EDUCATION, AND SPORTS SCIENCE.

Evidence-Based Practice of Sports Science in Education, Performance, and Health.

October 14th, 2017. Eastparc Yogyakarta, Indonesia



Published by
Faculty of Sport Sciences
 Universitas Negeri Yogyakarta



FAKULTAS ILMU KEOLAHRAGAAN
 UNIVERSITAS NEGERI YOGYAKARTA
 1 OKTOBER 1951 – 1 OKTOBER 2017

For Further Information:

Universitas Negeri Yogyakarta, Indonesia
 Phone : +62274 550826 (PR Office)
 Mobile : +62857 2932 3727 (Mr. Satya)
 +62815 7802 0803 (Mrs. Cerika)
 Email : yishpess@uny.ac.id
 Website : yishpess.uny.ac.id



UNIVERSITÄT PADERBORN
 Die Universität der Informationsgesellschaft



九州大学
 KYUSHU UNIVERSITY



UNIVERSITI PENDIDIKAN SULTAN IDRIS
 ارباب تعليمي قانديدين سلطان ادريس

SULTAN IDRIS EDUCATION UNIVERSITY



Chulalongkorn University
 จุฬาลงกรณ์มหาวิทยาลัย

YISHPESS PROCEEDINGS

THE 1ST YOGYAKARTA INTERNATIONAL SEMINAR ON HEALTH, PHYSICAL EDUCATION, AND SPORTS SCIENCE.

Evidence-Based Practice of Sports Science in Education, Performance, and Health.

Publisher

Faculty of Sport Sciences
Universitas Negeri Yogyakarta

Reviewer

Asc. Prof. Kenji Masumoto, Ph.D.	<i>(Kyushu University, Japan)</i>
Asst. Prof. Wanchai Boonrod, Ph.D.	<i>(Chulalongkorn University, Thailand)</i>
Profesor Madya Dr. Ahmad bin Hashim	<i>(Universiti Pendidikan Sultan Idris, Malaysia)</i>
Prof. Dr. Siswantoyo, M.Kes., AIFO.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Prof. Dr. Tomoliyus, M.S.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Dr. dr. B.M. Wara Kushartanti, M.S.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Dr. dr. Rachmah Laksmi Ambardini, M.Kes.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Caly Setiawan, Ph.D.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
dr. Angelica Anggunadi, Sp.KO.	<i>(Universitas Indonesia, Indonesia)</i>
dr. Alvin Wiharja	<i>(Indonesia Sports Medicine Centre)</i>

Editor

Saryono, M.Or.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
dr. Muhammad Ikhwan Zein, Sp. KO.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Nur Sita Utami, M.Or.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Fitria Dwi Andriyani, M.Or.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>

Editor Pelaksana

Pasca Tri Kaloka, M.Pd.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Krisnanda Dwi Apriyanto, M.Kes.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Duwi Kurnianto Pambudi, M.Or.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Risti Nurfadhilah, M.Or.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
Ranintya Meikahani, M.Pd.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>

Design & Lay Out

Sugeng Setia Nugroho, A.Md.	<i>(Universitas Negeri Yogyakarta, Indonesia)</i>
-----------------------------	---------------------------------------------------

The paper published in the proceeding is not necessarily a reflection of the attitude or opinion of the editor and executive, editor, expert editors and the responsibility for the contents or effect of the writing, still lies on the author.

**Article published in the proceeding is considered valid
by the certificate included in the presentation.**



Published by
Faculty of Sport Sciences
Universitas Negeri Yogyakarta



Secretariat:

Universitas Negeri Yogyakarta, Indonesia
Phone : +62274 550826 (PR Office)
Mobile : +62857 2932 3727 (Mr. Satya)
 +62815 7802 0803 (Mrs. Cerika)
Email : yishpess@uny.ac.id
Website : yishpess.uny.ac.id



PROCEEDINGS

THE 1ST YOGYAKARTA INTERNATIONAL SEMINAR ON HEALTH, PHYSICAL EDUCATION, AND SPORTS SCIENCE.

Evidence-Based Practice of Sports Science in Education, Performance, and Health.

October 14th, 2017. Eastparc Yogyakarta, Indonesia



Published by:

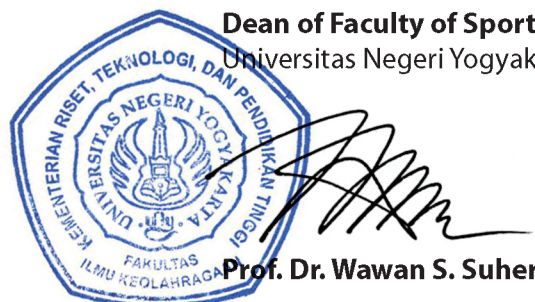
Faculty of Sport Sciences
Universitas Negeri Yogyakarta
October 14th, 2017

OPENING SPEECH

As the Dean of Faculty of Sport Sciences Universitas Negeri Yogyakarta, I would like to welcome and congratulate to all speakers and participants of the First Yogyakarta International Seminar on Health, Physical Education, and Sport Science (YISHPESS) 2017 entitled "Evidence-Based Practice of Sport Science in Education, Performance, and Health".

This international seminar is actually an implementation in the framework of the assessment of the achievements and sports culture in society that can support the achievements of the Indonesian people, so that there will be a significant role of practitioners, academicians, sport people, and sports observers from Universities, Institutions and Sports Organizations to help actively facilitate in the development, assessment of innovative sports science development so as to achieve sport achievements at the National and International level.

Finally, we thank all the committee of YISHPESS for their hard work in organizing this activity, and congratulate the invited speakers and all participants. Hopefully, this seminar is significant for the development of physical education, health, and sports sciences.

**Dean of Faculty of Sport Sciences,**
Universitas Negeri Yogyakarta
Prof. Dr. Wawan S. Suherman, M.Ed.


PREFACE

Alhamdulillahirobilalamin, thank Allah the First Yogyakarta International Seminar on Health, Physical Education, and Sport Science (YISHPESS) has been prepared well and on time. With all humility, we welcome and congratulate the speakers and participants of Yogyakarta International Seminar on Health, Physical Education, and Sport Science (YISHPESS) organized by the Faculty of Sport Sciences, Universitas Negeri Yogyakarta.

The YISHPESS 2017 is designed to updating and applying evidence-based practice in sports science aspects, including: education, performance and health. We hope that the invited speakers of this seminar can reduce the gaps between academic and field to get best output in the daily sport and health practices.

We would like to thank to Rector and the board of Universitas Negeri Yogyakarta for supporting this seminar come true. Praise and be grateful to the Lord, so that this proceeding can be issued. Hopefully, the publication of this proceeding can bring benefits to the participants in particular and readers in general.

Yogyakarta, October 14th, 2017
Chairperson of the Committee



Dr. Or. Mansur, M.S.

CONTENT

Preface

Content

Keynote Speaker

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.THE STRUGGLE OF JERRY LOLOWANG: A CASE STUDY OF CANCER SURVIVOR IN ACHIEVING | 76 |
| Author: M. Erika Rachman
Universitas Sebelas Maret | |
| 2.PHYSIOLOGICAL PROFILE OF MEMBERS HATHA YOGA EXERCISE | 83 |
| Author: Galih Yoga Santiko
Universitas Negeri Yogyakarta | |
| 3.THE EFFECT OF INTERACTIVE VIDEO IN TEACHING VOLLEY BALL THROUGH BASIC PASSING TECHNIQUE | 91 |
| Author: Rekha Ratri Julianti
Universitas Singaperbangsa Karawang | |
| 4.THE EFFECT OF DOMINANT PHYSICAL COMPONENTS, AND SELF-BASKET PLEEMBAN ATLET PALEMBANG TOWN SUCCESS FREE THROW | 98 |
| Author: Bayu Hardiyono
Universitas Binadarma | |
| 5. DIFFERENCES IN FUTSAL SKILL BETWEEN CLUB AND HIGH SCHOOL PLAYERS | 105 |
| Author: Agus Susworo Dwi Marhaendro
Universitas Negeri Yogyakarta | |
| 6. DEVELOPMENT OF INTEGRATED PHYSICAL EDUCATION LEARNING MODEL | 111 |
| Author: Sri Winarni
Universitas Negeri Yogyakarta | |
| 7.THE EFFECT OF BLOCK PRACTICE, SERIAL PRACTICE AND RANDOM PRACTICE TO IMPROVE BASKETBALL FUNDAMENTAL SKILL FOR BEGINNER | 123 |
| Author: Riyan Pratama
Universitas Bina Darma | |
| 8.THE DIFFERENCES OF INTRUCTIONAL MEDIA AND COORDINATION IN LEARNING OUTCOMES OF GROUNDSTROKES TENNIS ON NOVICE LEVEL ATHLETES | 131 |
| Author: Dian Pujiyanto
Universitas Bengkulu | |
| 9. ANDROID BASED REFERENCE MODEL OF STUDENT'S SKILL COACHING | 139 |
| Author: Endang Rini Sukamti
Universitas Negeri Yogyakarta | |

10. TEACHING BADMINTON SMASH BY USING TEAM GAME TOURNAMENT (TGT) MODEL IN SMP MUHAMMADYAH KARAWANG	145
Author: Didik Fauzi Dermawan Universities Singaperbangsa Karawang	
11. EFFECT OF INTENSIVE AND EXTENSIVE INTERVAL METHODS AGAINST ENHANCED SPEED ENDURANCE SPRINT 400 METERS	153
Author: Fajar Adi Nugroho Universitas Pendidikan Indonesia	
12. THE ATTEMPT OF IMPROVING POWERFUL KICK IN SOCCER USING WEIGHT TRAINING	161
Author: Yanuar Dhuma Ardhiyanto Universitas Negeri Yogyakarta	
13. IMPROVING STUDENTS LEARNING ACHIEVEMENT IN RUNNING BASIC LOCOMOTION MOVEMENT THROUGH GAME AT FIFTH GRADE STUDENT OF SD NEGERI 1 SURAKARTA IN THE ACADEMIC YEAR 2013/2014	167
Author: Luli Pitakasari Arnenda Universitas Sebelas Maret Surakarta	
14. THE INFLUENCE OF EXERCISE ON HOW TO THROW SOFTBALL BY USING THE TARGET TOWARDS THE ACCURACY OF THROWING SOFTBALL IN BUFFALOES UNS ATHELETE IN 2012	174
Author: Kristanto Adi Nugroho Universitas Sebelas Maret Surakarta	
15. MANAGEMENT OF DEVELOPING SWIMMING ACHIEVEMENT IN NPC (NATIONAL PARALYMPIC COMMITTEE) OF INDONESIA	181
Author: Nonik Rahmawati Universitas Sebelas Maret Surakarta	
16. CORRELATION OF BODY MASS INDEX AND CARDIORESPIRATORY FITNESS TO THE RISK OF METABOLIC SYNDROME IN ADOLESCENTS	189
Author: Abdullah Al-Hazmy Universitas Sebelas Maret Surakarta	
17. SOLO LAST FRIDAY RIDE AS A SPORT COMMUNITY IN SOLO	190
Author: Rianto Ardi Nugroho Universitas Sebelas Maret Surakarta	
18. DEVELOPING SNAKE LEADERS GAME FOR LEARNING MEDIA OF PHYSICAL EDUCATION SPORT AND HEALTH TO FOURTH GRADE STUDENTS OF MADANI ELEMENTARY SCHOOL IN PALU CITY	195
Author: Marhadi Universitas Tadulako	

19. THE EFFECT OF PLYOMETRICS TRAINING AND ACHIEVEMENT MOTIVATION TOWARDS LEG MUSCLE EXPLOSIVE POWER OF VOLLEYBALL ATHLETES IN UNIVERSITAS NEGERI PADANG	205
Author: Muhamad Sazeli Rifki Universitas Negeri Padang	
20. THE PSYCHOLOGICAL CHARACTERISTICS OF INDONESIAN SEA GAMES ATHLETES IN 2017 VIEWED FROM SPORT MARTIAL ARTS AND ACCURACY	210
Author: Bintara Universitas Negeri Yogyakarta	
21. EXPECTATION APPRECIATION AND PUBLIC PERCEPTION TO THE PHENOMENON OF STREETWORKOUT COMMUNITY	216
Author: Hari Hanggoro Universitas Sebelas Maret	
22. DEVELOPING OF TRADITIONAL GAMES AS NATION CULTURE THROUGH IN PHYSICAL EDUCATION LEARNING FOR ELEMENTARY SCHOOL STUDENTS	221
Author: Asriansyah Universitas PGRI Palembang	
23. CONTRIBUTION OF FLEXIBILITY, STRENGTH, AND BALANCE ON THE CARTWHEEL OF PKO STUDENTS CLASS 2016	229
Author: Ratna Budiarti Universitas Negeri Yogyakarta	
24. EFFECT SHORT-TERM AQUAROBIC EXERCISE ON DHEA-S LEVELS IN WOMEN	239
Author: Siti Baitul Mukarromah Universitas Negeri Semarang,	
25. PREDICTION OF THE INCIDENCE RATE OF CARDIOVASCULAR DISEASE FOR THE EMPLOYEES AND LECTURERS OF YOGYAKARTA STATE UNIVERSITY BASED ON THE POST-EXERCISE RECOVERY HEART RATE	240
Author: Cerika Rismayanthi Universitas Negeri Yogyakarta	
26. EFFECTIVENESS OF UMAC-CPF EXERCISE MODEL ON MOTOR ABILITY OF INDONESIAN CP FOOTBALL PLAYERS	247
Author: Fadilah Umar Universitas Sebelas Maret	
27. DEVELOPMENT OF WEB-BASED TRACER STUDY AT THE DEPARTMENT OF SPORTS COACHING EDUCATION	256
Author: Subagyo Irianto Universitas Negeri Yogyakarta	

28. MOUNTAINEERING ACTIVITIES OF MERBABU AS SPORTS RECREATION SOCIETY (PHENOMENOLOGY STUDY ABOUT SOCIETY CONDUCTING ACTIVITIES OF MOUNTAINEERING IN THE MOUNT MERBABU NATIONAL PARK)	261
Author: Faisal Adam Rahman Universitas Sebelas Maret	
29. INCREASE VO₂MAX BADMINTON ATHLETES USE EXERCISES FOOTWORK WITH METHOD HIIT (HIGH INTENSITY INTERVAL TRAINING)	265
Author: Donie Universitas Negeri Padang	
30. THE EFFECT OF EXERCISE MODEL BASED ON INTERACTIVE MULTIMEDIA TO SEPAKTAKRAW SKILLS	270
Author: Didik Purwanto Universitas Tadulako	
31. SOCCER TRAINING MODEL IN YOUTH ATHLETE BASED ON THE LONG-TERM ATHLETE DEVELOPMENT (LTAD)	275
Author: Komarudin Universitas Negeri Yogyakarta	
32. LEARNING RESULTS IMPROVEMENT OF FOREARM PASSING RESULTS OF VOLLEY BALL GAME THROUGH DRILL METHODS ON STUDENTS XI.IPS.1 IN PUBLIC SENIOR HIGH SCHOOL I TELAGASARI KARAWANG	280
Author: Akhmad Dimyati UNSIKA	
33. PHYSICAL EDUCATION AND SPORT IN SCHOOLS: APPLICATION SOCCER LIKE GAMES	292
Author: Mochamad Ridwan Universitas Negeri Surabaya	
34. THE DIFFERENCES OF PHYSICAL FITNESS LEVELS BETWEEN POOR AND EXCESSIVE NUTRITIONAL STATUS	297
Author: Sepriadi Universitas Negeri Padang	
35. THE STUDY OF KNOWLEDGE ABOUT FIRST AID (P3K) AND BASIC LIFE SUPPORT PRINCIPLES IN YOGYAKARTA COMMUNITY	305
Author: Eka Novita Indra Universitas Negeri Yogyakarta	
36. THE INFLUENCE OF TEACHING STYLE AND MOTOR ABILITY ON THE BOTTOM PASSING LEARNING OUTCOMES IN THE VOLLEYBALL	314
Author: Ahmad Muchlisin Natas Pasaribu Universitas Muhammadiyah Tangerang	

37. EFFECTIVENESS OF SHOOTING TRAINING MODEL FEBI FUTSAL GAMES ON THE IMPROVEMENT OF SHOOTING RESULT ON FUTSAL SPORTS FOR BEGIN PLAYER	321
Author: Febi Kurniawan Universitas Singaperbangsa	
38. DIFFERENCES OF LEARNING ACHIEVEMENTS INTERGRADE AND GENERAL CLASS SPORT CLASS BASED ON LEVEL EDUCATION OF PARENTS IN CLASS VII SMP N 4 PURBALINGGA	327
Author: Audi Akid Hibatulloh Universitas Negeri Yogyakarta	
39. LEARNING MODELS OF PHYSICAL ACTIVITY BASED ON MOTOR PERCEPTION KINDERGARTEN STUDENT	334
Author: B.Suhartini Universitas Negeri Yogyakarta	
40. DESIGN OF MEASURABLE SPORTS CLUB IN ELEMENTARY SCHOOL IN BALI PROVINCE	341
Author: Suratmin Universitas Pendidikan Ganesha	
41. ANALYSIS OF PHYSICAL CONDITION OF SOCCER ATHLETE'S PORDA OF BEKASI CITY	348
Author: Apta Mylsidayu Universitas Islam 45 Bekasi	
42. HEALTH AND HEALTHY LIFESTYLE ENHANCEMENT THROUGH SPORT AND PHYSICAL EDUCATION CREATIVE APPROACH	356
Author: Wing Prasetya Kurniawan Universitas Nusantara PGRI Kediri	
43. THE EFFECTS OF PHYSICAL EXERCISE THROUGH GAME-MODEL AND CIRCUIT-MODEL EXERCISES APPROACH ON THE MAXIMUM AEROBIC CAPACITY	367
Author: Umar Universitas Negeri Padang	
44. DIFFERENCES INFLUENCE OF INTERVAL DRILL EXERCISE BETWEEN ACTIVE AND PASSIVE ON SKILLS OF ATHLETE AT THE AGE OF CHILDREN	377
Author: Hariyuda Anggriawan Universitas Sebelas Maret	
45. EXERCISE FOR CHILDREN WITH AUTISM SPECTRUM DISORDERS	383
Author: Anita Suryani Universitas Indonesia	

46. THE EFFECT OF KICKING SPEED, STRENGTH AND LEG MUSCLE EXPLOSIVE POWER ON THE ABILITY OF DOLLYO CHAGI OF TAEKWONDO DOJANG ATHLETE	390
Author: Nurul Ihsan Universitas Negeri Padang	
47. CORRELATION BETWEEN PROTEIN INTAKE WITH MUSCLE STRENGTH OF ATHLETES	398
Author: Wilda Welis Universitas Negeri Padang	
48. DEVELOPMENT OF MONITORING BOOKS FOR SWIMMING	404
Author: Nur Indah Pangastuti Universitas Negeri Yogyakarta	
49. THE DIFFERENCE IN THE EFFECTS OF BIRTH TYPES ON THE MOTOR SKILLS OF CHILDREN AT AN EARLY AGE	411
Author: Pangung Sutapa Universitas Negeri Yogyakarta	
50. THE EFFECT OF SUPPLEMENT SOYBEAN MILK AND WHEY PROTEIN IN LOAD EXERCISESTOWARD THE INCREASING HYPERTROPHY OF THIGH MUSCLES	417
Author: Khairuddin Universitas Negeri Padang	
51. PHYSICAL ACTIVITY OF CHILDREN IN DIENG PLATEAU BANJARNEGARA REGENCY (PHENOMENOLOGICAL STUDIES FROM THE VIEWPOINT OF SPORTS VALUES)	424
Author: Dody Tri Iwandana Universitas Sebelas Maret	
52. PICTURE MEDIA DEVELOPMENT FOR PENCAK SILAT LEARNING IN HIGH SCHOOLS	427
Author: Nur Rohmah M., M.Pd Universitas Negeri Yogyakarta	
53. THE EFFECT OF IMAGERY ON BEGINNER TENNIS PLAYERS' FOREHAND DRIVE SKILL	436
Author: Risti Nurfadhila Universitas Negeri Yogyakarta	

54. THE EFFECT OF HONEY SUPPLEMENTATION BEFORE PHYSICAL ACTIVITY TOWARDS THE PLASMA MALONDIALDEHYDE LEVEL IN MALE WISTAR RATS (<i>RATTUS NORVEGICUS</i>)	443
Author: Krisnanda DA Universitas Negeri Yogyakarta	
55. THE LEARNING RESULT OF FOOTBALL BASIC TECHNIQUE SKILL	451
Author: Arsil Universitas Negeri Padang	
56. BREAKING THE CHAIN OF “KLITIH” THROUGH CHARACTER EDUCATION IN PHYSICAL EDUCATION	458
Author: Pasca Tri Kaloka Universitas Negeri Yogyakarta	
57. PHYSICAL EDUCATION LEARNING THROUGH TRADITIONAL GAMES TO IMPROVE COOPERATION AND RESPONSIBILITY AT ELEMENTARY SCHOOL	466
Author: Ranintya Meikahani Universitas Negeri Yogyakarta	
58. MODEL DEVELOPMENT BASIC DRIBLING FOOTBALL-BASED TRAINING TECHNIQUES FOR BEGINNING ATHLETES AGED 8-12 YEARS	474
Author: Ahmad Atiq Universitas Tanjungpura Pontianak	
59. THE MODEL OF GAMES TO DEVELOP FUNDAMENTAL MOVEMENT OF KINDERGARTEN STUDENTS	481
Author: Uray Gustian Universitas Tanjungpura	
60. DEVELOPMENT OF MEDIA-BASED TRAINING 3GS (TRIPLE GAME SET); MONOPOLY, SNAKES LADDERS AND FENCING PUZZLE FOR CHARACTER EDUCATION EFFORTS IN BEGINNER ATHLETES	489
Author: Faidillah Kurniawan Universitas Negeri Yogyakarta	
61. STUDENTS'S PERCEPTION TOWARDS INTEGRATED LEARNING METHOD USING VIRTUAL MICROSCOPE IN HISTOLOGY COURSE	498
Author: RL Ambardini Universitas Negeri Yogyakarta	

62. THE DEVELOPMENT OF TOPURAK (TOTOK-PUKUL-GERAK) MANIPULATION MODEL FOR KNEE JOINT REPOSITION	504
Author: BM. Wara Kushartanti Universitas Negeri Yogyakarta	
63. THE EFFECTIVENESS OF TRAINING GUIDED IMAGERY IN LOWERING ANXIETY ON ATHLETES	511
Author: Donie Universitas Negeri Padang	
64. EFFECT OF FRESH COW MILK AND PASTEURIZATION MILK TOWARD GLUCOSE IN SOCCER PLAYERS ACCOMPANIED BY PHYSICAL ACTIVITY.	517
Author: Rini Syafriani Institut Teknologi Bandung	
65. THE CONTRIBUTION OF LEG MUSCLE STRENGTH AND DYNAMIC BALANCE TOWARDS THE ABILITY OF DOLLYO CHAGI KICK	524
Author: Yogi Setiawan Universitas Negeri Padang	
66. LAY UP SHOOT SKILL OF FIK UNP STUDENTS (EXPERIMENTAL STUDY OF TEACHING METHOD AND LEARNING MOTIVATION TOWARD LAY UP SHOOT SKILL OF FIK UNP STUDENTS)	529
Author: Hendri Neldi Universitas Negeri Padang	
67. THE EFFECT OF PRACTICE AND GAME LEARNING APPROACH ON THE CHEST PASS LEARNING ACHIEVEMENT ON EXTRACURRICULAR BASKET BALL PLAYING	536
Author: Puthut Endiarto Universitas Sebelas Maret	
68. THE INFLUENCE OF CIRCUIT TRAINING METHOD ON THE ENHANCEMENT OF PHYSICAL FITNESS OF SPORTS EDUCATION DEPARTMENT STUDENTS	541
Author: Sefri Hardiansyah Universitas Negeri Padang	
69. EFFECT OF PHYSICAL ACTIVITY ON OXIDATIVE STRESS: A REVIEW OF IMPACT AND IMPLICATION AFTER TRAINING	548
Author: Wildan Alfia Nugroho Universitas Sebelas Maret	
70. SPORT DEVELOPMENT INDEX IN SEVERAL CITIES/REGENCIES IN JAVA ISLAND : A REVIEW OF BENEFITS AND OUTCOME	554
Author: Boy Sembaba Tarigan Universitas Sebelas Maret	

71. THE EFFECT OF MANIPULATION TRAINING COMPLEX TO MAXIMUM STRENGTH	559
Author: Mansur Universitas Negeri Yogyakarta	
72. MANAGEMENT OF FACILITIES SPECIAL CLASS OF SPORT (KKO) IN SMA NEGERI 4 YOGYAKARTA	569
Author: Tri Ani Hastuti Universitas Negeri Yogyakarta	
73. DEVELOPMENT OF LEARNING ATHLETIC LEARNING MODELS RELEASE DIRECTLY BASED GAMES IN ELEMENTARY SCHOOL	578
Author: Hartati Universitas Sriwijaya	
74. THE EFFECT OF COOPERATIVE LEARNING MODEL OF TEAM GAMES TOURNAMENT ON LAY UP SHOOT TOWARDS THE LEARNING OUTCOMES (EXPERIMENTAL STUDY) ON BASKETBALL SMP NEGERI KARAWANG	586
Author: Rahmat Iqbal Universitas Singaperbangsa Karawang	
75. THE EFFECTS OF PRACTICE METHOD AND ACHIEVEMENT MOTIVATION ON MAXIMUM VOLUME OXYGEN OF FOOTBALL PLAYERS	594
Author: Didin Tohidin Universitas Negeri Padang	
76. THE EFFECT OF PROTEIN SUPPLEMENT ON MAXIMUM STRENGTH TOWARD THE MEMBERS OF ONE GYM FITNESS CENTER PADANG	600
Author: Adnan Fardi Universitas Negeri Padang	
77. THE EFFECT OF PACITAN SWEET ORANGE JUICE TO MALONDIALDEHYDE LEVEL (MDA) AFTER ECCENTRIC ACTIVITY	606
Author: Indra H.S Universitas Negeri Surabaya	
78. COMMUNITY INTERESTS FOLLOWING TRADITIONAL SPORT ACTIVITIES IN CAR FREE DAY ACTIVITIES	611
Author: Mia Kusumawati Universitas Islam" 45" Bekasi	
79. THE EFFECT OF TWO ACTIVE RECOVERIES IN REDUCING LACTIC ACID OF BADMINTON ATHLETES	617
Author: Ainur Rasyid PGRI Sumenep	
80. THE EFFECT OF AEROBIC DANCE AND CYCLING ON THE PSYCHOLOGICAL WELL-BEING OF TEENAGERS	623
Author: Rizki Kurniati Universitas Pembinaan Masyarakat Medan	

- 81. SURVEY OF THE LEISURE TIME ACTIVITIES OF THE STUDENTS OF FACULTY OF SPORTS SCIENCE, UNIVERSITAS NEGERI YOGYAKARTA** 632
Author: Dapan
Universitas Negeri Yogyakarta
- 82. ANTROPOMETRY AND PHYSICAL FITNESS FACTORS DETERMINANT DRIBBLING AND PASSING FUTSAL ABILITY OF STUDENT EXTRACURRICULAR AGED 12-15 YEARS** 637
Author: Nizamuddin Nur Ramadaniawan
Universitas Sebelas Maret
- 83. MULTI STATION REBOUNDER TOOL DEVELOPMENT AS A GUIDE FOR TRAINING INSTRUMENT BASED ON INDEPENDENT FOOTBALL** 643
Author: Santoso Nurhadi
Universitas Negeri Yogyakarta
- 84. DEVELOPMENT OF TOOL DETECTOR LJDOF-SDH FOR LONG JUMP AS A MEDIA FOR BASIC MOTOR OF TRACK AND FIELD LEARNING BASED ON SENSOR** 651
Author: Sriawan
Universitas Negeri Yogyakarta

THE INFLUENCE OF CIRCUIT TRAINING METHOD ON THE ENHANCEMENT OF PHYSICAL FITNESS OF SPORTS EDUCATION DEPARTMENT STUDENTS

Sefri Hardiansyah

Faculty Of Sport Science, Universitas Negeri Padang
hardiansyah@fik.unp.ac.id; sefrihardiansyah1988@gmail.com

Abstract

Objectives: The purpose of this research is to see the effect of circuit training method to increase physical fitness of FIK UNP students.

Methods: It was a quasi-experiment given to students of Faculty of Sport Science (FIK) UNP who follow the lecture of Physical Condition Formation. The sample in this study was 18 people, consisting of 4 females and 14 males students chosen by purposive sampling technique. The treatments were given 16 times. The instrument used in this research was Indonesia Physical Fitness Level Tests (TKJI) in the aged of 16-19 years. The elements of physical conditions that were measured in this instrument were the speed, the strength of arm muscles, the strength and endurance of abdominal muscles and the endurance and explosive power of leg muscle.

Result: Based on the measurement of pre test, the average physical fitness level of FIK UNP students was 16.22 within average category (the highest score was 20 and lowest one was 10). While based on the measurement of the post test, it was obtained that the average score was 17.56 within good category (the highest score was 22 and the lowest one was 14) and based hypothesis testing using t-test (comparative) statistical formula, it was obtained the $t_{observe} = 3.69$ while t_{table} at $\alpha = 0.05$ and degrees of freedom (df) = n-1 was 1.74. Thus, $t_{observe} 3.69 > t_{table} 1.74$.

Conclusions: Based on statistical tests and discussions that have been done, It can be concluded that the method of training circuits has a significant influence on the enhancement of physical fitness of FIK UNP students.

Keywords: circuit training method, physical fitness level, sports education department students

INTRODUCTION

Education as a lifelong process of human development, one of them is Sports Education. In Act No. 3 of 2005 on National Sport System article 1, paragraph 11 stated that "sports education is a sport that is carried out as part of a regular and continuous education process to acquire knowledge, personality, skills, health and physical fitness".

Faculty of Sport Science is one of the Faculty at Universitas Negeri Padang that organizes specific education in the field of Sports Education, Sports Training, and Health and Recreation. Most of the lectures at the Faculty of Sport Science are practices in the field. In addition, the students also have training activities outside such as Football, Basketball, Volleyball, Handball, Cricket, Hockey, Pencak Silat, Karate and many other activities followed by students according to their respective hobbies and sports. Therefore it is essential for the students of FIK UNP Sports Education Department to have a good physical fitness so that students can follow all lectures and activities optimally.

Based on the experience and observations of writers in the field as the lecturer of Physical Condition Formation course, it was often seen that the students were quickly exhausted, especially in following the lecture practice. This will certainly bad for the students because besides following the lecture, the students were also busy to other activities related to the physical fitness. Therefore, the authors think it is very necessary for the students of the Department of Sport Education FIK UNP to improve the physical fitness for all activities in order to run smoothly. Hence, the authors are interested in conducting research to provide solutions to the problems faced by some students of the Department of Sport Education FIK UNP.

Definition of Exercise

Exercise is a process of consciously enhancing the athlete to achieve a maximum accomplishment with physical, technical, tactical and mental loads that are regular, focused, gradual and repetitive in time (Suharno 1993: 5). According to Bompa (1994: 2) "the exercise is a systematic, progressive repetition process with the ultimate goal of improving sports performance". Furthermore, Harsono (1988: 90) states that "the exercise is a systematic practice that is repeatedly done, within the more days the amount of training burden is increasing". In essence, exercise is an activity performed with a specific purpose that is repeatedly done.

Circuit Training Method

Circuit training methods are one type of an exercise program which is different from others programs and practice principles such as the principle of increased practice, overburdening, specificity, and the individual. In addition, this training is a simple exercise method that can be used to improve especially physical elements of muscle. This is in line with the opinion of Lejla (2016: 29) who states circuit training is created for the purpose of research and was designed to be simple to improve stamina and muscle endurance.

PBSI (2007: 45) states that the circuit method is "a series of several different types of exercises in which a person varies between one exercise with another in one interval". This is one form of efficient exercise because one can do more exercise in a shorter time. This is in accordance with Jill's opinion (2017: 2) "circuit-style programs have gained popularity due to the practicality and efficiency". According to Perman (2013: 51) "training circuit training is one method that can be given to improve general physical condition where in training circuit training the main target in the element of physical condition is strength, pulmonary heart resistance, velocity, and speed".

According to Sodikoen (1991: 62) says "the form of circuit training is arranged in a circle sequentially around the arena (field), starting from stage I, II, III and so on ." In an exercise, the athlete's circuit shall be through post after heading and shall not exceed the next heading. Furthermore, Sodikoen (1991: 65) re-explains that "one circuit has been considered completed if the athlete has completed the exercise in each post according to the target time set". According Edwarsyah (2017) circuit training method "is an exercise that combines many forms of exercise. These forms of circuit training are usually a combination of all elements of physical condition such as agility, endurance, strength, speed and other elements".

From the statements above, it can be said that circuit training is an exercise that combines many forms of exercise into posts consisting of a combination of all elements of physical conditions such as speed, endurance, strength, explosive muscle limbs, and physical condition so that training is more effective and efficient.

Definition of Physical fitness

According to Sutarman in Arsil (2009: 9) "physical fitness is an aspect, that is the physical aspect of total fitness which gives a person the ability to live a productive life and can adapt to each physical load (physical stress) worthy". Then the center of physical and recreational fitness of Depdikbud (1996: 1) states that physical fitness is the ability of one's body to perform daily work tasks without causing significant fatigue.

On the other hand, Sullivan in Gusril (2004: 25) states physical fitness is "ability to perform normal daily activities with a passionate and full of alertness, without experiencing significant fatigue and still have energy reserves to enjoy leisure activities as well as emergency events which came suddenly ". From opinions above, it can be said that physical fitness is a state of the body to be able to perform daily activities without experiencing significant fatigue.

Components of Physical fitness

The center for physical and recreational fitness of Depdikbud (1996: 1) states that physical fitness consists of several components, namely: "(1) Cardiovascular endurance, (2) Muscle endurance, (3) Muscle strength, (4) Flexibility, (5) Body composition, , (6) Speed of movement, (7) Agility, (8) Balance, (9) reaction time, (10) coordination ".

According to Gusril (2004: 65), the component of physical fitness consists of two parts: (A) health related fitness, consisting of cardiac endurance (cardiorespiratory), muscle strength, muscle

endurance, flexibility, body composition; (b) skill related fitness consists of: speed, strength, balance, agility, coordination, and reaction speed".

Components of Physical Healthiness consist of:

1. Strength

Strength is "the ability of a group of muscles to generate power during contractions. Muscle strength must be possessed by the child. If the child does not have muscle strength, he can not perform physical play activities such as walking, running, jumping, throwing, climbing, hanging and pushing." (Gusril, 2008: 16). Strength is the ability of the muscles in holding or receiving the burden to carry out the work performed. The power can be shown with the ability of a person in the movement of pushing, lifting and pulling an object.

2. Endurance.

Endurance "is defined as survival time a person can do at the length of time to the intensity of work or away from fatigue. Durability consists of two parts: general endurance and local muscle endurance. Common endurance is related to the ability of the cardiovascular system, whereas local muscular endurance is related to the ability of local muscles.

So endurance is a very influential thing in life, because it deals with the cardiovascular system that is in a person and endurance muscles that support each other.

3. Ability (flexibility)

The effectiveness of one's adjustment in various physical activities is largely determined by body shape. "Good formation, or wide range of motion, is a physiological and mechanical problem. In swimming, for example, efficient movements for various skills require high levels of elasticity". (Ateng, 1992: 67). The formation is very supportive in the implementation of learning penjasorkes school.

Components of physical fitness in terms of performance consist of:

1. Coordination

Coordination is "the ability to integrate different movements into a single pattern of movement". (Ateng, 1992: 67). There are various requirements for each activity. Coordination exists in basketball skills such as dribbling, catching balls, and shooting. Individuals who are fit in these skills can perform not only every phase of the overall skills but are also able to change from one skill pattern to another in a very effective way.

2. Balance

Balance is the ability to master the motion of the body tool. (Ateng, 1992: 68). For instance, the upright arm fulcrum is an example of balance. There are lots of skills that require a high balance such as skates, gymnastics floor. The balance prevents a person from falling when the current pattern is being distracted.

3. Speed

According to Ihsan (2017) "speed means a movement in a short time that can travel far enough" and speed is the ability of individuals to perform the same movement over and over again in the shortest time. (Ateng, 1992: 67) Speed is the number of movements per unit time, for example in sprint is the number of repetitive movements of the legs per unit time. Muscle power and speed are closely related. The success of running fast can not be achieved without muscle strength to move the legs quickly.

4. Accuracy

Accuracy is the ability to master movement against a particular object. (Ateng, 1992: 68). Objects can be distance or can also be direct contact with body parts. Like on the right throw on a baseball, the second is catching something.

5. Agility

Agility is the ability to change the body position. (Ateng, 1992: 67). Examples of agility can be seen as in football, basketball or hurdle. Agility also includes a reversing element that is an essential element in various sports skills. Speed is another element in the success of the performance of

agility. Individuals are capable to change one position to another with high coordination and speed as the agility component.

6. Explosive Power

Ordinary muscle power is also called explosive power. Explosive power is the ability of a muscle or a group of muscles to overcome the load resistance at high speed in a complete movement. Explosive power is usually used for jumping, at the start on short running, to start swimming, throwing, kicking and all movements in sports which are done suddenly with maximum strength accompanied by high speed (Neldi, 2008: 112). Based on the description above, it can be concluded that the main components related to physical fitness are: the ability of a person in performing daily tasks, increasing the work force, especially heart function, blood circulation, lung, and muscle, without experiencing significant fatigue, power recovery, still have energy reserves, and generally help improve one's quality of life.

Physical fitness is also said to be aspects of physical ability that support one's success in performing various activities in his life. The activities can be in the form of daily work and for the immediate needs or activities performed during leisure time. A person's daily work or duties may vary. For the students of FIK UNP Sports Education Department, physical fitness is useful for supporting all student activities everyday starting from lectures, certain sports activities to student activities. The higher a person's physical fitness, the more likely it is to complete a job and the greater the chance to enjoy life. The quality of physical fitness is closely related to the quality of life. Physical fitness will vary from person to person and depends on several things: occupation, health condition, gender, age, level of the trained person and nutritional status.

METHODS

Types of Research

In accordance with the type of research that is quasi experiment research, it used training circuit method as the independent variable and physical fitness as the dependent variable. The design of research implementation is shown in Figure 1.

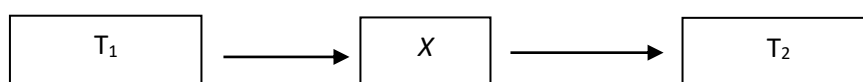


Figure 1. Research Design

Where:

- T₁ : Initial data
- X : Circuit Training Training
- T₂ : Final Data

Population and Sample

According Sugiyono (2008: 117) population is a "generalization of the specific region consisting of objects/subjects that have certain qualities and characteristics set by the researchers to be studied and then is drawn conclusions. The population in this research was the students of Department of Sport Education FIK UNP which amounted to ± 6000 people. The sampling technique was purposive sampling technique in which only the students of Sport Education Department who follow the lecture of physical condition formation. So, the sample in this study was as many as 18 people consisting of 14 male students and 4 female students.

RESULTS AND DISCUSSION

1. Pre Test Data

From the results of measurements taken on the sample, it was obtained that the highest score was 21, the lowest score was 10, and average (mean) was 16.22, the median value was 16, and the standard deviation was 2.84. The details of the distribution of pre-test data can be seen in Table 1.

**Table 1. Frequency Distribution of Pre Test Data
Circuit Training Method**

No	Score Interval	Frequency		Physical Fitness Classification
		Fa	Fr (%)	
1	22 – 25	0	0	Very Good
2	18 – 21	6	33.33	Good
3	14 – 17	9	50	Average
4	10 – 13	3	16.67	Poor
5	5 – 9	0	0	Very Poor
Total		18	100	

2. Post Test Data

From the results of measurements taken on the sample, it was obtained that the highest score was 22, the lowest score was 14, and the average count (mean) was 17.50, the median was 17.5, and the standard deviation was 2.12. The details of the post test data distribution can be seen in Table 2.

**Table 2. Frequency Distribution of Post Test Data
Circuit Training Method**

No	Score Interval	Frequency		Physical Fitness Classification
		Fa	Fr (%)	
1	22 – 25	1	5.56	Very Good
2	18 – 21	8	44.44	Good
3	14 – 17	9	50	Average
4	10 – 13	0	0	Poor
5	5 – 9	0	0	Very Poor
Total		18	100	

Hypothesis testing

The hypothesis in this research is there is significant influence of circuit training method to increase physical fitness of Department of Sport Education students at FIK UNP. The hypothesis was tested by using t-test at a significant level of α 0.05%.

From the data analysis obtained, the $t_{count} (3.69) > t_{table} (1.74)$. Thus H_0 is rejected, and H_a is accepted. It means that there is a significant influence of training circuits method to increase the physical fitness of the students of Sports Education Department FIK UNP accepted empirically.

Based on data analysis that has been done, the result of research indicates that Circuit Training Method can improve physical fitness of FIK UNP Education Sport Program students. As has been pointed out in previous theory studies, circuit training methods are an exercise method consisting of several posts where the material at each post varies. It is because the circuit training method is related to the stimulus method given with different stimulus variations so that it tends to be more effective to improve the ability of the physical condition especially the endurance. This is in accordance with the opinion of Lejla (2016: 29). "Circuit training created for the purpose of this research is designed to be simple, and also to improve stamina and muscle endurance".

in this study a given circuit training consists of 6 stages, which train the muscles as follows: in stage (I) arm muscle strength, stage (II) abdominal muscle strength, stage (III) waist muscle, stage (IV) flexibility, stage (V) speed, and stage (VI) coordination. The exercise was given 16 times. Circuit training programs provided is ranging from low exercise intensity to high intensity. This is done because the sample in this study is the students of the Department of Sport Education Faculty of Sport Science Universitas Negeri Padang where not all samples have athlete background. Hence, the training starts from the low intensity to the high intensity. According to Tadeusz (2017: 33), "Training was based on assumptions of circuit training with high intensity, which was supposed to enable the influence on different components of physical fitness. According to Tadeusz's opinion, the training circuit is given up to the high intensity in order to have an impact on the various components of physical fitness such as speed, strength, explosive power and the state of the field.

Based on the results of the research it can be seen that the method of training circuits is an exercise method that can be used to improve physical fitness, this is because the circuit training method has several advantages. According to Harsono in Yendrizal (1997: 26) (b) Each athlete can practice according to their respective abilities, (c) Each athlete may observe and see their respective progress, (d) the exercise is easily monitored, (e) The relatively short time frame can accommodate many people who are practicing at once".

CONCLUSION AND SUGGESTION

Based on the findings of research and discussion of research results, it can be concluded that training circuit method gives significant influence to the improvement of Physical Fitness of the Sport Education Department students, Faculty of Sport Sciences (FIK), Universitas Negeri Padang.

Based on the above conclusions, there are some suggestions as follow:

1. The students need to follow the training process given well so that the exercise can provide the maximum effect.
2. The general public needs use the circuit training method in an effort to improve physical fitness because the training circuit method is suitable for both athletes and non athletes.

REFERENCES

- Arsil. 2009. *Tes Pengukuran dan Evaluasi Pendidikan Jasmani Dan Olahraga*. Padang : FIK UNP
- Ateng, Kadir. 1992. *Azaz Dan Landasan Pendidikan Jasmani*. Jakarta: Depdikbud.
- Bompa, Tudor O. 1994. *Power Training For Sport*. Canada: Mocaic press.
- Depdikbud. 1996. *Ketahuilah Tingkat Kesegaran Jasmani Anda*. Jakarta: Depdikbud Pusat Kesegaran Jasmani Dan Rekreasi.
- Edwarsyah, Hardiansyah Sefri, Syampurma Hilmainur. (2017). "Pengaruh Latihan Circuit Training Terhadap Kondisi Fisik Atlet Pencak Silat Unit Kegiatan Olahraga Universitas Negeri Padang. " *Journal: Penjakora*. Vol. 4 No 1: 51-63.

- Gusril. 2004. *Beberapa Faktor Yang berkaitan Dengan Kemampuan Motorik Siswa Sekolah Dasar Negeri Kota Padang*. Disertasi. Jakarta.UNJ.
- Harsono. 1988. *Coaching Dan Aspek-aspek Psikologis Dalam Coaching*. Jakarta: P2LPTK
- Jill Maples, Gina Sobrero, Mark Schafer, T.A. Tolbert, Scott Arnett, Whitley Stone. 2017. "A Comparison of High Intensity Functional Training and Circuit Training on Health and Performance Variables in Women: A Pilot Study. " *Journal Women in Sport and Physical Activity*, Volume 25 2017, 1-10.
- Lejla Sebic, Adriana Ljubojevic, Amra Nozinovic, Selja Omerhodzic, Dailla Kajevic. 2016. "Effects of circuit training on Body composition of women. " *Journal Homo Sporticus Issue 2* 2016, 28-34.
- Neldi, Hendri. 2008. *Pembelajaran Pendidikn Jasmani Dan Olahraga*. Padang: FIK UNP.
- N. Ihsan, Yulkifli, Yohandri. 2017. "Development of Speed Measurement System for Pencak Silat Kick Based on Sensor Technology. International Conference on Recent Trends in Physics 2016 (ICRTP2016) IOP Publishing. " *Journal of Physics: Conference Series* 755 (2016) 011001 doi: 10.1088 / 1742-6596 / 755/1/011001
- PBSI. 2007. *Penataran Pelatih Bulutangkis Tingkat Nasional*. Jakarta: PB PBSI.
- Sodikoen, Imam. 1991. *Pembinaan Prestasi Bola Basket di PGSD*. Jakarta: P2TK Dirjen Dikti Dikbud
- Sugiyono. 2008. *Metode Penelitian Pendidikan*. Bandung: Alfabeta
- Suharno. 1993. *Metodologi Penelitian Olahraga. Seri Bahan Penataran Pelatih Tingkat Muda/Madya*. Jakarta: Koni Pusat. Pusat Pendidikan Dan Penataran
- Undang-undang RI No 03. 2005. *Sistem Keolahragaan Nasional*. Yogyakarta : Pustaka Yudisti
- Tadeusz Ambrozy. 2017. "Influence of experimental training with external resistance in a form of "kettlebell" on selected components of women's physical fitness. *Journal Baltic Journal of Health and Physical Activity*, Volume 9 (1) 2017, 28-36.
- Yendrizal. (1997). *Pengaruh Latihan Beban Dan Kemampuan Motorik Otot Terhadap Kekuatan Otot*. Tesis. Jakarta

EFFECT OF PHYSICAL ACTIVITY ON OXIDATIVE STRESS: A REVIEW OF IMPACT AND IMPLICATION AFTER TRAINING

Wildan Alfia Nugroho

Graduate School of Sebelas Maret State University

wildanalfian_nugroho@yahoo.com

Abstract

This paper discusses the scientific evidence that has been collected regarding the influence of physical activity on oxidative stress. One of the body's responses to exercise or physical activity is increased levels of free radicals. Physical activity can increase the formation of free radicals in the body thereby increasing oxidative stress. Oxidative stress is a condition that occurs because of an imbalance between the production of free radicals with antioxidant defense systems in the body. MDA (Malondialdehyde) is one of the indicators used to determine oxidative stress in humans. MDA is the result of lipid peroxidation in the body due to free radicals. Increased conditions of oxidative stress have implications for muscle damage and if it lasts in the long run will lead to various diseases such as hypertension, atherosclerosis, diabetes, heart failure, stroke, and other chronic diseases. It is recommended that the understanding of this should be understood by all sports actors, both trainers, builders, and athletes themselves that will be useful to reduce the negative impact of physical activity so that positive impact or sports achievement will increase.

To reduce the negative impact of oxidative stress it is necessary to minimize one of them by taking antioxidants after physical activity. Consuming antioxidants in this form of vitamin C proven to reduce the occurrence of oxidative stress. Vitamin C easily scavenges free radicals and thus can prevent oxidative damage to important biological macromolecules. Vitamin C supplementation can suppress lipid peroxidation during exercise so as to reduce oxidative stress.

Keywords : physical activity, oxidative stress, MDA, Vitamin C.

INTRODUCTION

Physical activity is any body movement produced by skeletal muscles that require energy expenditure. Physical activity can be a variety of activities, ranging from daily activities to sports activities that aim to get the achievement. Physical activity is divided into three levels ie light, moderate, and heavy physical activity (Meiriyani Deliana Novitasary et al, 2013: 1043). Mild physical activity is anything related to moving the body. Medium physical activity is the movement of the body that causes a considerable amount of energy expenditure, in other words a move that causes the breath a little faster than normal. While heavy physical activity is the movement of the body that causes considerable energy expenditure (burning calories) so that the breath is much faster than usual (WHO, 2010: 25).

Physical activity can increase body oxygen consumption 10 to 15 times higher than rest time (Ni Made Dwi Sandhiutami et al, 2010: 18). Increased use of oxygen mainly by contracting muscles causes an increase in electron leakage from mitochondria to become reactive oxygen compounds (SOR). Generally 2-5% of the oxygen used in metabolic processes in the body will become superoxide ions so that when heavy physical activity increases the production of free radicals (I Made Jawi et al, 2008: 66). One of the body's responses to exercise or physical activity is increased levels of free radicals. According to Susiana Candrawati (2013: 456) physical activity can increase the formation of free radicals in the body thus increasing oxidative stress.

Oxidative stress is a condition that occurs because of an imbalance between the production of free radicals with antioxidant defense systems in the body. Free radicals are defined as a molecule or molecular section containing one or more unpaired electrons in the farthest orbit of the atom or molecule and can be self-existent (Halliwell, 1991). From the description above can be concluded that physical activity can affect physiological condition of cellular level that is with increasing of

oxidative stress. The type, intensity and duration of physical activity will also affect the oxidative stress caused. Once it is known that physical activity will increase oxidative stress, then the next step is how to overcome these negative effects. Taking into account the negative effects of physical activity or exercise is expected to increase its positive impact. Provision of vitamin C after physical activity or exercise will help reduce the occurrence of oxidative stress (Sureda Antoni, et al, 2008).

Formation of Free Radicals Due to Physical Activity

According to Clarkson (1995: 131-41) exercise or physical activity can increase the formation of free radicals through:

1). Increased oxygen reduction in the respiratory chains in the mitochondria.

The need for energy in the muscles of excessive contraction will increase, meaning that the inclusion of electrons into the respiratory chains of the mitochondria also increases. The two to four percent reduction in oxygen in the mitochondria is not 100 percent perfect, resulting in the formation of reactive oxygen (ROS) compounds such as superoxide (O_2^*), hydrogen peroxide (H_2O_2), peroxy radicals (OOH^-), hydroxyl radicals (OH^-). The main source of oxygen reduction in the mitochondria occurs within the inner membrane (inner membrane) layer of the mitochondria during oxidative phosphorylation. Briefly the emergence of electron leaks that form free radicals in oxidative phosphorylation is described as follows: In oxidative phosphorylation of synthesis of ATP is associated with oxygen reduction or cell respiration which is essentially a process of NADH reoxidation by oxygen. ATP synthesis in oxidative phosphorylation uses a proton gradient energy source found in two solutions separated by the inner membrane of the mitochondria. As the ions flow from a high grade solution to a low grade solution this energy and energy is used for the synthesis of ATP from ADP. High ion levels are maintained with ion pumps that drain protons from low grade solutions to high grade solutions. The proton stream requires the energy gained from redox solving ATP.

The energy generated in the redox process is used for the transfer of H^+ ions from the intra-mitochondrial fluid through the inner membrane out of the mitochondria. Over time the concentration of H^+ ions beyond mitochondria becomes higher than the concentration of H^+ ions in the mitochondria, the gradient of concentration resulting in H^+ ions flowing from outside the mitochondria into the mitochondria. During this flow, energy will be generated by ATP synthesis. In mitochondria, every mole of ATP is required to transfer 2 moles of H^+ .

2) Increased yield of epinephrine metabolism and other catecholamines.

During exercise there is an increase in sympathetic nerve activity, resulting in increased metabolism of epinephrine and other catecholamines with O_2 to form free radicals. In the long-term exercise of catecholamines in the plasma increases, resulting in stimulation of the adrenergic beta receptor, there is increased oxidative metabolism, especially in skeletal muscle and heart muscle. This metabolism to form energy from lipids, increases lipolysis through the beta-oxidation pathway. This beta-oxidation pathway generates free radicals. In addition, autocurridation of epinephrine into adrenochrome will form superoxide (O_2^*) (Simpson, Luchessi 1997: 1206).

3) Increased activity of macrophages and leukocytes after muscle damage.

Hours after muscle damage due to mechanical trauma, leukocytes of neutrophils will be attracted to the damaged areas. The number of leukocytes of neutrophils is increasing with the release of toxins and free radicals. Neutrophil will not survive in this area for more than a day, but it is continued by monocytes that are attracted to the damaged muscle area to form macrophages. This macrophage will also release free radicals (Clarkson, P.M. 1995: 138). Neutrophil plays an important role as the body's defense against invasion of bacteria or viruses. In the event of inflammation or muscle damage due to stretching or ischemia of contraction muscle time, the first body defense response is neutrophils attracted to the injury region by chemotactic factors released by damaged cells. Neutrophil then releases two kinds of substances ie lysozyme and superoxide free radicals (O_2^*). The lysozyme in charge of clearing debris cells and damaged proteins, superoxide (O_2^*) serves to mempagositosis bacteria or viruses. Neutrophil movement towards injury other than useful overcome inflamasi also resulted in secondary formation of superoxide free radicals (O_2^*).

(Meydani, M; Evans, W.J. 1993: 187). Superoxide (O_2^*) is formed by the enzyme mieloperoksidase and NADPH oxidase. Once free radicals are formed, it will lead to the formation of new free radicals by chain reactions. (Pincemail, J. et al., 1990: 432).

4) Increased activity of xanthine oxidase. (XO)

Xanthine oxidase is the main source of free radical formation during ischemia and cardiac reperfusion. During ischemia or when cardiac muscle contraction energy is met from the breakdown of ATP to ADP + AMP + energy for myocardial contraction. When oxygen depletion or ischemia AMP (Adenosine Mono Pospat) is converted into hypoxanthine - xanthine uric acid by xanthine oxidase through the oxygen reduction chain that results in superoxide (O_2^*). The longer the ischemia, the more hipoxantin, the more superoxide radicals (O_2^*) are formed.

Hypoxanthin and uric acid in plasma can be increased by 10 x after high intensity exercise. (Hellsten, et al. 1993: 197). Xantin oxidase is released by the muscle endothelial cells that are contracting. Similarly in severe exercise there will be increased activity of xanthine oxidase enzyme and increased lipid peroxidation in skeletal muscle cells, heart muscle and liver. (Norman, B. et al, 1987: 503). At the time of reperfusion or oxygen is sufficient, xanthin dehydrogenase is oxidized to xanthine oxidase and increased mitochondrial activity will increase the occurrence of free radicals. Here it appears that xanthin dehydrogenase plays a major role in the occurrence of free radicals during exercise. During the adequacy of oxygen or during an aerobic atmosphere, ATP is formed in the mitochondria through oxidative phosphorylation that produces free radicals and hypoxanthine-xanthine is converted to uric acid through xanthine dehydrogenase. When an atmosphere of oxygen deprivation (ischemia) increased xanthinoxidase enzyme activity that increases the formation of oxygen free radicals (Kim, J.D, et al., 1996: 123).

5) Increased activity of NADPH oxidase and Citochrome p. 450

When sufficient oxygen is available, NADPH oxidase catalyzes the transfer of one electron from NADPH to O_2 , resulting in superoxide (O_2^*) and O_2^* subsequently by dismutase to H_2O_2 . The end result of this chain reaction is the dissolution of the unsaturated fatty acids (Poly Unsaturated Fatty Acid, PUFA) chains into various toxic (toxic) compounds to cells such as: Aldehydes such as malondialdehyde (MDA), 9-hydroxynonenal (HNE) .Serta various hydrocarbons such as ethane (C_2H_6) and pentane (C_5H_{11}) (Wijaya, A. 1996: 83).

All this results in severe cell membrane damage and endangers cell life. Based on this then the MDA is widely used as a marker of cell damage due to free radical attack on lipidperoksidasi. MDA is a highly reactive compound which is the end product of lipid peroxidation, and is usually used as a biological biomarker of lipid peroxidation to assess oxidative stress (De Zwart LL et al, 1998). The widely used method for this MDA examination is based on 36 reactions; one MDA molecule with two TBA molecules (thiobarbituric acid) will form TBARS (thiobarbituric acid reactive substance) (Wijaya, A.1996: 98).

The need for energy in muscles that is excessive contraction will increase, which means that oxygen uptake into the tissue also increases and the inclusion of electrons into the respiratory chains of the mitochondria also increases. This increase in VO_2 will result in increased free radical formation. A balanced state will occur between the production of free radicals with antioxidant defenses. This balance can be lost by excessive free radical production after excessive or irregular exercise or due to deficiency in antioxidant defense mechanisms. Due to the imbalance between free radicals and antioxidants this will arise oxidative stress that can damage the cell membrane, DNA, or protein.

How to Overcome Oxidative Stress Due to Physical Activity

In general, antioxidants are divided into 2 groups: enzymatic antioxidants / primary antioxidants / antioxidants prevention and non-enzymatic antioxidants / antioxidants secondary / antioxidant chain reaction breaker. Enzymatic antioxidants consist of superoxide dismutase (SOD), glutathione peroxidase (GPx), and catalase which can give hydrogen atoms rapidly to radical compounds, then the antioxidant radicals formed soon turn into more stable compounds. These antioxidants work by preventing the formation of new free radical compounds, or converting free radicals that have

formed into less reactive molecules. Non-enzymatic antioxidants are also called chain reaction antioxidants consisting of vitamin C, vitamin E, and beta carotene. These antioxidants work by chopping off a chain-oxidation reaction from free radicals or by capturing them. As a result, free radicals will not react with cellular components. These enzymatic antioxidants and non-enzymatic antioxidants work together to combat the activity of oxidant compounds in the body.

Increased oxidants in the body that exceed the body's ability to neutralize it, can cause tissue damage. In this condition, oxidants can attack various components of the body with all the consequences. For example, an oxidant attack on unsaturated fatty acids is an important component of cell membrane constituents. Such an attack can lead to a chain reaction known as lipid peroxidation. The process results in the breakdown of fatty acids into various cell-toxic compounds, such as malondialdehyde (MDA) and non-hydroxy. The resulting MDA is then released into the blood, so that MDA levels in the blood (serum) can be an indirect sign of increased ROS (Hairrudin and Dina Helianti, 2009: 207- 208). This fact shows that heavy physical activity can cause harmful side effects to health, through increased oxidants, if the body's antioxidant defense system is not able to neutralize it, will lead to a condition called oxidative stress. Oxidative stress is believed to be an important factor in the emergence of various diseases, in these conditions require additional antioxidants from the outside (Suryohudoyo 2005).

Antioxidants in a biological sense are compounds capable of counteracting or reducing the negative effects of oxidants in the body (Winarsi, 2007). Antioxidants work by donating an electron to an oxidant compound so that the activity of the oxidant compound can be inhibited. The balance of oxidants and antioxidants is very important because it is related to the functioning of the body's immune system. These conditions are primarily to maintain the integrity and functioning of lipid membranes, cell proteins and nucleic acids and to control signal transduction and gene expression in immune cells (Meydani et al., 1995). Oxidation reactions occur at all times in the body and trigger the formation of highly active free radicals that can damage cell structure and function. However, the reactivity of these free radicals can be inhibited by antioxidant systems that complement the immune system (Halliwell and Guteridge, 1991).

Severe physical activity or unusual training will cause muscle injury, muscle protein release and muscle pain. The mechanism of delay in muscle damage after severe physical training is not fully understood, but it is thought to be delayed injury due to an inflammatory reaction induced by phagocytic infiltration caused by excessive mechanical stress, increased intracellular calcium ion concentrations, and oxidative stress. There have been reports on whether antioxidants can decrease muscle damage due to significant increases in oxidative products in training muscles and in blood after training which is also proportional to other parameters of delayed muscle damage (Wataru et al., 2006). In general during exercise there will be an increase in lipid peroxidation and is regularly followed by the formation of antioxidants of the body. Exercise will obviously improve the body's antioxidant defense system (antioxidant defense system). Knowledge of the influence of antioxidant supplementation on exercise is still limited. Vitamin E supplementation affects the decline of MDA plasma and pentane during exercise. Selenium supplementation will also reduce MDA formation. Supplementation of combination of vitamin C and glutathione decreased plasma MDA and pentane at rest. Oxidation causes damage to muscle fibers, so exercise will trigger muscle pain after exercise. Supplementation of vitamin C can reduce muscle pain (Clarkson, P.M. 1995: 143).

Vitamin C As Antioxidant

Having known the negative impact of physical activity that can increase the free radical levels resulting in oxidative stress, then the thing we need to do after doing physical activity is to reduce the negative impact. One effort that can be done to reduce the negative impact is to consume vitamin C after physical activity or exercise. Vitamin C is a white crystalline organic acid that feels sour and odorless. In the liquid state of vitamin C is easily damaged by oxidation by oxygen from the air, but more stable when in a state of dry crystals (Achmad Djaeni Sediaoetama, 2012: 131). Vitamin C is present in two forms in nature, namely L-ascorbic acid (reduced form) and L-dehydro ascorbic acid (oxidized form). Oxidation back and forth L-ascorbic acid into L-dehydro ascorbic acid occurs

when in contact with copper, heat, or alkali. Both forms of vitamin C are biologically active but the reduced form is the most active (Sunita Almatsier, 2009: 186).

The function of vitamin C in the body is related to its nature as an antioxidant. Although the exact mechanism is not known, it appears that vitamin C plays a part in many metabolic processes that take place in body tissues (Achmad Djaeni Sediaoetama, 2012,131). Vitamin C contains antioxidants that can capture free radicals and also contribute to the formation of intracellular collagen, wound healing and body resistance against infection and stress, the conversion of folic acid into an active form of folinic acid, the formation of steroid hormones, from cholesterol (Roni Prisyanto et al, 2014 : 292). As an antioxidant, vitamin C works by donating electrons, that is, by transferring one electron to a metal compound. Vitamin C can also contribute electrons into intracellular and extracellular biochemical reactions and capable of destroying reactive oxygen compounds in cells (Roni Prisyanto et al, 2014: 290)

Vitamin C as a catcher of free radicals directly reacts with superoxide anions, hydroxyl radicals, singlet oxygen, and lipid peroxide. As the ascorbic acid reductor will donate one electron to form a non-reactive semidehidroaskorbat and subsequently undergo disproportionation reactions forming an unstable dehidroaskorbet. Dehidroaskorbat will be degraded to form oxalic acid and threonic acid (Roni Prisyanto et al, 2014: 293).

Free radical reactions with antioxidants in the body produce radical antioxidant compounds, for example the tocopheryl radicals formed from oxidation of tocopherol. The radicals are stable enough to be reduced by vitamin C or GSH enzymes to form quinol so that it will not oxidize the unsaturated fatty acids present around them. Similarly oxidized forms of vitamin C are ascorbous free radicals and dehidroaskorbat can be reconstituted into ascorbate by GSH or by enzymes dehidroaskorbat reductase (Nunung Kurniasih et al, 2015: 170). Thus the consumption of vitamin C after physical activity is believed to reduce negative impact due to physical activity that is the emergence of oxidative stress.

CONCLUSION

Physical activity or sports in addition to a positive impact for the body there is also the negative impact that is the emergence of oxidative stress. Oxidative stress is a condition that occurs because of an imbalance between the production of free radicals with antioxidant defense systems in the body. One way to reduce the negative impact is by providing antioxidants from outside the body. Vitamin C is one of the antioxidants that are believed to reduce oxidative stress.

REFERENCES

- Achmad Djaeni Sediaoetama. 2008. *Ilmu Gizi*. Jakarta: Dian Rakyat.
- Clarkson, PM. 1995. "Antioxidant an Physical Performance. " *Clin Rev Food Sci Nutr*; 35: 131 – 41
- De Zwart LL, Meerman JHN, Commandeur JNM, Vermulen NPE. "Biomarker of free radical damage. Application in experimental animals and humans. " *Free Rad Biol Med* 1998; 26: 202-26
- Evy Damayanthi, et al. 2010. "Aktivitas Antioksidan Bekatul Lebih Tinggi Daripada Jus Tomat dan Aktivitas Antioksidan Serum Setelah Intervensi Minuman Kaya Antioksidan." *jurnal Gizi dan Pangan*, 5 (3): 205–210 .
- Hairrudin,Dina Helianti. 2009. "Efek Protektif Propolis Dalam Mencegah Stres Oksidatif Akibat Aktifitas Fisik Berat (Swimming Stress). " *Jurnal Ilmu Dasar*, Vol. 10 No. 2, Juli 2009 : 207-211.
- Halliwell B. 1991. "Reactive Oxygen Species in living systems: source, biochemistry and role in human disease. " *Am J Med* 1991; 91 (suppl 30) : 14S-21S
- Hellsten, W.Y, Balsom, P.D, Norman B, Sjodin, B.1993. "The Effect of High –Intensity Training on Purine Metabolism in Man. " *Acta Physiol Scand* ; 149: 405 – 12
- I Made Jawi, et al. 2008. "Antioxidant effect of water extract purple sweet potato to mice blood and many organ that given maximal physical exercise. " *Jurnal Veteriner* Vol. 9, No.2 : 65-71.

- Kim, J.D, Carter, R.J.Yu, B.P. 1996. "Influence of Age, Exercise, and Dietary Restriction on Oxidative Stress in Rats." *Aging Clin Exp Res*: 8: 123 – 9.
- Meiriyani Deliana Novitasary, et al. 2013. "Hubungan Antara Aktivitas Fisik dengan Obesitas pada Wanita Usia Subur Peserta JAMKESMAS di Puskesmas Wawonasa Kecamatan Singkil Manado." *Jurnal e-Biomedik (eBM)*, Volume 1, Nomor 2, Juli 2013.
- Meydani M, Evans, W.J.1993. Free Radical, Exercise, and Aging. In : Yu BP, Ed. Free Radicals in Aging, Boca Raton, FL: CRC Press, 183 – 204.
- Ni Made Dwi Sandhiutami, et al. 2010. "Uji Aktivitas Antioksidan Minyak Buah Merah (*Pandanus conoideus* LAM.) Secara *in Vitro* dan *in Vivo* Pada Tikus Yang Diberi Beban Aktivitas Fisik Maksimal." *Jurnal Sains dan Teknologi Farmasi*, Vol. 15, No.1, 2010, halaman 18-28..
- Norman, B. Sovelli, A. Kisjsieir, L. Janson, E. 1987. "ATP Breakdown Products in Human Muscle During Prolonged Exercise to Exhaustion." *Clin Physiol*; 7: 503 – 10.
- Nunung Kurniasih, et al. 2015. Potensi Daun Sirsak (*Annona Muricata* Linn), Daun Binahong (*Anredera codifolia* (Ten) Steenis), Daun Benalu Mangga (*Dendrophthoe pentandra*) sebagai Antioksidan Pencegah Kanker. *Jurusan Kimia, Fakultas Sains dan Teknologi UIN Sunan Gunung Djati*.
- Pincemail, J. Camus, G. Roesgen, A. Dreezen, E. Bertrand, Y. Lismonde, M. Deby, C. 1990. "Exercise Induces Pentane Production and Neutrophil Activation in Humans: Effect of propranolol." *Eur J Appl Physiol*; 61:319-322
- Roni Prisyanto, et al. 2014. "Pengaruh Pemberian Kombinasi Vitamin C dan E terhadap Jumlah Hemoglobin, Leukosit, dan Trombosit Pasca Iradiasi Sinar Gamma." *NATURAL B*, Vol. 2, No. 3, April 2014.
- Simpsons, P.J. Lucchesi, B.R.1997. "Free Radicals and Myocardical Ischemia and Reperfusion Injury." *J. Lab Clin Med*: 19: 1195 – 1206.
- Sunita Almatsier. 2009. *Prinsip Dasar Ilmu Gizi*. Jakarta: PT Gramedia Pustaka Utama
- Suryohudoyo P. 2005. *Oksidan, Antioksidan dan Radikal bebas. Dalam:Ilmu Kedokteran Molekuler. Kapita Selekta*. Jakarta: Sagung Seto.
- Susiana Candrawati. 2013. "Pengaruh Aktivitas Fisik Terhadap Stres Oksidatif." *Mandala of Health*. Volume 6, Nomor 1, Januari 2013
- Wataru, A., Naito,Y., Yoshikawa, T. 2006. Exercise and functional foods.
- WHO. 2010. *Physical Activity*: In Guide Community Preventive Service.
- Wijaya A.1996. Radikal Bebas dan Parameter Status Antioksidan. Forum Diagnostikum : Prodia Diagnostics Educational Services.
- Winarsi Hery. 2007. *Antioksidan Alami dan Radikal Bebas*. Yogyakarta: Kanisius



Published by
Faculty of Sport Sciences
 Universitas Negeri Yogyakarta



UNIVERSITÄT PADERBORN
Die Universität der Informationsgesellschaft



九州大学
 KYUSHU UNIVERSITY



**UNIVERSITI
 PENDIDIKAN
 SULTAN IDRIS**
 UNIVERSITI PENDIDIKAN SULTAN IDRIS



Chulalongkorn University
 จุฬาลงกรณ์มหาวิทยาลัย



FAKULTAS ILMU KEOLAHRAGAAN
 UNIVERSITAS NEGERI YOGYAKARTA
 1 OKTOBER 1951 – 1 OKTOBER 2017

For Further Information:

Universitas Negeri Yogyakarta, Indonesia
 Phone : +62274 550826 (PR Office)
 Mobile : +62857 2932 3727 (Mr. Satya)
 +62815 7802 0803 (Mrs. Cerika)
 Email : yishpess@uny.ac.id
 Website : yishpess.uny.ac.id

Faculty of Sport Sciences Universitas Negeri Yogyakarta

ISBN 978-602-8429-74-0

