



SRM

INSTITUTE OF SCIENCE & TECHNOLOGY
Deemed to be University u/s 3 of UGC Act, 1956



Effects of Pilates, HIIT on selected Physiological, Biochemical and Psychological variables among regular sports players



SRM

INSTITUTE OF SCIENCE & TECHNOLOGY

Deemed to be University u/s 3 of UGC Act, 1956

Principle Investigator:

Lavanya D.L,MPT (Sports)

Ph-DPhysiotherapy (Ph,D-PT Ext -HS)

SRMIST (Kattankalathur)

Email Id: lavanyasports@gmail.com

Phone number: 9884870345

GUIDE:

Dr. V. M. Vinodhini, MD
HOD and Professor,
Department of Biochemistry,
SRM Medical College hospital and Research
Centre.
E-Mail Id: vinodhiv1@srmist.edu.in

CO-GUIDE:

R. Ram Mohan Singh
Associate Professor
Department of Physical Education and Sports
Pondicherry University
KALAPET, Puducherry – 605014
Orcid id : 0000-0001-7553-8575

EXTERNAL EXAMINER

Dr.Santhi silambanan ,M.D
Professor,
Department of Biochemistry
SRMC&RI,SRIHER,
PORUR,
CHENNAI-600116

EXTERNAL DC

Dr.M.K.Franklin Shaju., MPT(Neuro).,
MSPT(Sports)., PG Dip (Bio-Stat).,
Ph.D,
Professor and Principal,
R.V.S College of Physiotherapy,
Sulur, Coimbatore – 641 402,
Tamil Nadu, India.&R

Introduction:

Regardless, one of the main challenges to physiological homeostasis is exercise, a component of primitive “fight or flight” response [1].

It has been widely evidenced that significant changes in the endocrine system which requires certain physiological accommodation and adjustment occurred in response to exercise

The accommodation in turn is regulated by specific hormones like testosterone and cortisol [2]. Cortisol is a catabolic hormone that promote energy substrate mobilization and suppress immune function [3].

The intensity and duration of the exercise session and fitness status of an individuals has a great impact on this specific hormone response to exercise. Regular exercise and physical fitness minimize the effect of inflammation [4].

Introduction

Chronic psychological stress, physical inactivity and abdominal adiposity have been associated with persistent, systemic, low-grade inflammation and exert adverse effects on mental and physical health.

The anti-inflammatory effects of regular exercise can promote behavioral and metabolic resilience and protect against various chronic diseases associated with systemic inflammation [5].

Physical fitness achieved through regular exercise and spontaneous physical activity, confers resilience by inducing positive psychological and metabolic reactivity as well as increased positive mood and well-being [6].

Introduction:

Exercise and sports goes hand on hand, where sports players end up with overtraining, which is especially seen among athletes. Though overtraining is the key principle require for peak performance,

it is found to be the major factor for developing stress and mood disorder among athletes. Mood disturbance and stress, increase in athletes during the course of a high-volume training season in proportion to the training stimulus. (Dianna Purvis).

Low intensive exercise following strenuous exercise helps in active recovery. Where, HIIT is an alternative to low intensive exercise can be implemented.

High intensive interval training (HIIT) is considered one of the most effective form of exercise for improving the physical and mental performance of athletes.

High-intensity interval training (HIIT) is as a time-efficient alternative to moderate or low-intensity continuous exercise for improving variables related to endurance and anaerobic performance in young and adolescent sports players [7].

HIIT training has been shown to increase fitness levels and helps to regulate blood sugar levels, decreases in body fat, heart rate and reduce risk of high blood pressure.

HIIT may also help lower blood sugar and improve insulin sensitivity [8]. Studies have also revealed that HIIT decreased anxiety, stress, and depression among athletes [9].

High-intensity interval training (HIIT) embraces a variety of interval protocols with varying duration and interspersed recovery breaks involving (i) “repeated sprint training” (RST) with sprints of ~3–7 s duration, interspersed with recovery periods of less than 60 s

Introduction

(ii) “sprint interval training” (SIT) with ~30 s all-out sprints, and 2–4 min of passive recovery periods, and (iii) HIIT with either short (<45 s) or long (2–4 min) interval durations (Buchheit and Laursen, 2013).

Depending on the intensity and duration of the exercise, as well as the recovery and the number of repetitions and sets. HIIT protocols stimulate processes involving the transport and utilization of oxygen, thereby stimulating the enhancement of peak oxygen uptake ($\text{VO}_{2\text{peak}}$) in adults (Laursen and Jenkins, 2002).

Nowadays, HIIT has become popular for improving variables related to endurance performance among multiple populations, including adult endurance athletes (Kilen et al., 2014) team sports (Helgerud et al., 2011) and other individual sport events (Bonato et al., 2015) HIIT is also recommended for improving endurance in moderately trained individuals sedentary adults and in connection with diseases (Ellingsen et al., 2017).

Introduction:

Depending on the intensity and duration of the exercise, as well as the recovery and the number of repetitions and sets.

HIIT protocols stimulate processes involving the transport and utilization of oxygen, thereby stimulating the enhancement of peak oxygen uptake ($\text{VO}_{2\text{peak}}$) in adults (Laursen and Jenkins, 2002).

Nowadays, HIIT has become popular for improving variables related to endurance performance among multiple populations, including adult endurance athletes (Kilen et al., 2014) team sports (Helgerud et al., 2011) and other individual sport events (Bonato et al., 2015)

HIIT is also recommended for improving endurance in moderately trained individuals sedentary adults and in connection with diseases (Ellingsen et al., 2017).

Introduction:

The Pilates training method is based on the key principles of management of the center of gravity, concentration, control, precision, flow, and breathing [10].

Pilates training can be performed with an apparatus or without an apparatus (mat-work). Independent of the training method, the manipulation of acute training variables (i.e., intensity, volume, and rest intervals) might influence the adaptive response and increase sports performance [11].

Previous study demonstrated that Pilates training promotes improvements in the physical fitness of young athletes [12].

Hence, in this study we will observe the effect of pilates and HIIT on sports players with the physiological, biochemical and psychological change.

Justification of the study:

Stress is a factor of life that affects everyone, but sports players tend to suffer from it more than non-sports players, due to the amount they required to balance, between schoolwork, practices , games, as well as family pressures and everyday life. (carly m fullerton)

According to the review an estimated 20-60% of sports players suffer from the stress caused by excessive exercise and inadequate recovery [4].

Researchers and practioners are seeking innovative ways to help the sports players to garner health benefits. In which interval exercise has been proposed as a viable means to accrue health benefits which is a shorter duration alternative to continuous exercise.

Justification & Novelty of the Study

Interval exercise is a viable form of exercise that generally includes intermittent bouts of high intensity exercise separated by periods of recovery (GIABALA ET ALL 2014)

Music is commonly implemented to increase the leisure and enjoyment associated with an exercise session. The application of music before, during, and after exercise has been the subject of an extensive body work. (Karageorghis,2017)

Novelty of the Study

Studies on biochemical parameters associated with the effect of pilates has not been carried out.

Studies on the combined effect of pilates and HIIT with PSS among sports person has not been carried out.

Aim

The aim of this study is to investigate the effect of pilates and HIIT with the physiological, biochemical and psychological changes among sports players.

Objectives:

Primary objectives:

- 1.To compare the physical fitness (based on the ACSM guidelines) of sports players in pre and post 16 weeks of pilates and HIIT.
- 2.To compare the levels of lipid profile parameters and blood cortisol level of sports players in pre and post 16 weeks of pilates and HIIT.
- 3.To evaluate the stress levels of sports players using perceived stress scale (PSS).
- 4.To compare the stress score of sports players in pre and post 16 weeks of pilates and HIIT.

Objectives

Secondary objectives:

- 1.To compare the levels of fasting plasma glucose levels of sports players in pre and post 16 weeks of pilates and HIIT.
- 2.To compare the insulin resistance of sports players in pre and post 16 weeks of pilates and HIIT.

Review of literatures:

S.No	AUTHOR	TITLE	JOURNAL	FINDINGS
1	L JONES ET AL (2020)	Affective responses to high intensity interval training with continuous and respite music	Journal of sports sciences	Music has been shown to enhance affective response to continuous exercise
2	Awobajo et al (2015)	Changes in stress index, blood oxidants and lipid profile between trained and untrained young female adults during treadmill exercise test	Nigerian Journal of Experimental and Clinical Bio sciences	Involvement of young female adults in exercise taining promotes antioxidant response system and also reduced the TCR
3	A.Caplin et al (2021)	Effects of exrcise intensity on the cortisol response to a subsequent acute psychosocial stressor	Psychoneuroendocrinology 131 (2021) ELSEVIER	Cortisol level were showing difference in both groups and affected by exercise
4	Matos et al (2018)	High –Intensity Interval Training improves Markers of Oxidative met	Frontiers in Physiology	Eight weeks of HIIT increased the content of proteins related to oxidative metabolism in skeletal muscle of individuals with obesity, independent of changes total body fat.
5	P.Senthil selvam et al (2020)	Effect of pilates on academic stress among college students	International journal of physiotherapy and research	Have a positive result on neuro psychological variable such as anxiety, motivation and attention of students in academic achievements

Materials and methods:

Design of the research

Type of study : Prospective study

Sample design: Selective sampling technique

Study period : 4 Year

Setting : DL Fitness Studio & Clinic,
St. Thomas Mount (Adambakkam)

Study population: Sports person between the age group of 18- 40 years

Sample size calculation

Calculated as 30, based on the study conducted by Awobajo Funmileyi Olubajo et al on “Change in stress index, blood antioxidants and lipid profile between trained and untrained young female adults during treadmill exercise test: A comparative study” in year 2015.

Formula :

$$n = \frac{2 SD^2 (Z_{\alpha} + Z_{1-\beta})^2}{d^2}$$
$$n = \frac{2 \times 529 (2.576 + 2.326)^2}{945.56}$$
$$n = \frac{2 \times 529 (24.02)}{945.56}$$
$$n = \frac{25413.16}{945.56}$$
$$n = 26.8 = 30 \quad n = 30$$

Note: There may be drop out in follow-up, hence sample size of 40 is taken.

Where, n – sample size, SD – mean of SD1 and SD2, d – difference between μ_1 and μ_2 , Z_{α} – 99% Confidential interval and $Z_{1-\beta}$ – 99% power of the study.

No. of study groups: Two groups

Pre - pilates and HIIT: Sports players between the age group of 18-40 years

Post - pilates and HIIT: Sports players after the effect of 16 weeks of pilates and HIIT.

Inclusion and exclusion criteria :

Inclusion criteria:

- Sports players of both the gender between the age group of 18 – 40 years will be included in the study.

Exclusion criteria

Exclusion criteria:

Includes self-report of following:

- Smoking
- Alcoholic
- Current use of anti-inflammatory, hypoglycemic or drugs known to affect the metabolism Known case of:
 - Liver disease
 - Renal disease
 - Treatment for psychological disorders.

The study protocol will be submitted to the Institutional Ethical Committee for approval

Methodology:

After obtaining informed and written consent from the participants, personal and medical history will be collected.

The physical fitness assessment, laboratory investigation and administration of questionnaires namely PSS will be done among the selected participants.

The participants are subjected to pilates along with music and HIIT in an interval of 5 days for 16 weeks. After 16 weeks of pilates and HIIT again the physical fitness assessment, laboratory investigation and administration of questionnaires namely PSS will be done to compare the effects.

Methodology

Physical fitness assessment

Fitness assessment based on the ACSM guidelines will be measured in all the participants.

Purpose:

To measure variables such as heart rate, blood pressure, and oxygen uptake during exercise, how much ever the oxygen utilized

To collect baseline and follow-up information for charting a clients fitness program progress to help motivate a client by establishing and meeting reasonable fitness goals

Basic needed to Assess Cardiorespiratory Fitness

Basic needed to Assess Cardiorespiratory Fitness :

- Heart Rate Determination
- Blood Pressure Measurement
- Rate Of Perceived Exertion

Physical fitness assessment:

Timing of Measurements during assessments

During most graded exercise test, the following measurements are take at the indicated times:

Heart Rate

- During a 2 -minute stage: every minute
- During a 3-minute stage, at minutes 2 &3, and then at every subsequent minute until steady state achieved

Basic needed to Assess Cardiorespiratory Fitness

Blood Pressure

- Measured once during each stage, toward the end of the stage

Rate Of Perceived Exertion

- Assessed once during each stage, toward the end of the stage

Sequence Of Measurements

- For most graded exercise tests(with 3 min stages)it is practical to take the measurements according t the following schedule
- At 2 :00 minute: heart rate
- At 2:15 minute: RPE
- At 2:30 minute: Blood pressure
- At 3:00 minute: Heart rate
- EQUIPMENT(TREADMILL) CALLIBRATION DONE AT REGULAR INTERVALS

Physical fitness assessment:

Protocol Selection

Test selection is influenced by the purpose and goals of the exercise test and characteristics of client being tested

1. Submaximal exercise test are used extensively to assess fitness, to evaluate changes in fitness following a training program, and to provide an estimate of VO_2max for establishing an initial training program
2. Submaximal testing estimates VO_2max based on the assumed linear relationship between heart rate and VO_2max . Heart rate is measured at multiple workloads during the test, and VO_2max at an estimated maximum heart rate ($220 - \text{Age}$) is calculated
3. Submaximal testing is based on several assumptions:
 - a) Measurements are made while the client is in steady state
 - b) A Linear relationship exists between heart rate and VO_2
 - c) Maximal heart rate is similar to all individuals in a given age group
 - d) Mechanical efficiency is the same for all the clients

Physical fitness assessment:

Protocol Selection For The Clients:

Exercise testing must take into account age related changes in cardiovascular and other physiological variables these variables include

- Maximal heart rate
- Maximal cardiac output
- VO₂max
- Resting and exercise blood pressure
- Muscular strength
- Flexibility and body fat percentage

Prolonged warm up phase is recommended

Biochemical Investigations:

Following the aseptic protocol, 5 ml of fasting venous blood sample will be collected in plain (red) and fluoride (gray) vacutainers. After analysing the sample for fasting plasma glucose and lipid profile parameters the remaining sample will be stored in deep freezer at -20°C for further analysis of insulin and cortisol

BIOCHEMICAL PARAMETERS	METHODS	INSTRUMENT
Fasting serum Glucose	Hexokinase method	Beckman Coulter AU480
Total cholesterol	Cholesterol oxidase method	Beckman Coulter AU480
Triglyceride	Enzymatic GPO-PGO	Beckman Coulter AU480
HDL-C	Direct antibody inhibition method	Beckman Coulter AU480
LDL-C		
Insulin	Sandwich ELISA	Bio-Rad ELISA reader and washer
Cortisol	Solid phase competitive ELISA	Bio-Rad ELISA reader and washer

Calculations:

$$\text{VLDL} = \text{Triglyceride} / 5$$

$$\text{HOMA-IR} = [\text{Fasting glucose mg/dl} \times \text{fasting insulin } \mu\text{U/ml}] / 405$$

Questionnaire:

- The perceived stress scale (PSS) is a classic stress assessment instrument that helps to measure individual stress levels. The tool remains a popular choice for helping us to understand how different situations affects our feeling and our perceived stress. This scale is validated in India [13] and also in Tamil [14]. The 10-question PSS is a valuable and efficient way of identifying participants at risk for perceived stress.
- Score ranging from:
- 0-13: considered low stress
- 14-26: considered moderate stress
- 27-40: considered high perceived stress

HIIT:

Before starting HIIT training the participants are subjected to Par-Q (Physical activity Readiness Questionnaire). The HIIT training starts with 8 or 12 minutes of walking test with constant speed. Then pushing to next level where the player gives maximum exertion to get maximal heart rate. At the end of this training VO_2 Max is calculated which gives player standard of fitness. The procedure is followed for next 16 week

Exercise Programming:

Purpose:

- Enhancement of physical fitness for daily activities, recreation, or competitive athletes

ACSM Recommendations:

- All adults should accumulate 30 minute of physical activity on most (preferably all) days of the week.

Greater benefits realized from greater amounts of physical activity in an interval of 5 days

Exercise Programming:

Components Of Comprehensive Exercise Program Include

- Warm up
- Cardiovascular endurance(aerobic stimulus)
- Resistance Exercise
- Flexibility Training
- Cool down

Exercise Prescription

- Select a mode of exercise that is comfortable and provides full ROM
- Include 8 to 10 major muscle group exercises.
- Program activity with attention of time efficiency, because exercise training programs lasting longer than 1 hour usually are associated with lower compliance

EXERCISE PRESCRIPTION

ACSM Recommendation

- One should perform set of each exercise to volitional fatigue.
- choose a limited range of repetitions between 3 and 20(e.g.,3-16,8-12,6-10)
- These exercises should be performed on two or three non consecutive days per week training one day per week will maintain strength for several weeks
- Different exercises for a given muscle group may be performed every two or three training sessions
- Perform both the lifting and lowering phase of exercise in controlled manner at moderate to slow speeds(3-second concentric, 3-second eccentric over the full ROM
- Maintained proper mechanics

EXERCISE PRESCRIPTION

Pilates:

In Pilates, muscles are never worked to exhaustion, so there is no sweating or straining (just intense concentration).

The workout consists of a variety of exercise sequences that are performed in low repetitions, usually 5 to 10 times, each three sets, over a session of 45 to 90 minutes.

Mat work and specialized equipment for resistance are also used. Pilates will be accompanied with music without Lyrics.

Statistics:

Data will be analyzed using Statistical Package for the Social Sciences (SPSS 22.0). For all statistical tests, a p value < 0.05 will be taken to indicate a significant difference.

Continuous variables will be presented as Mean $\pm$ SD for normally distributed data. Student's t- test will be used to compare the difference in mean levels of analyzed biochemical parameters between the two groups.

Pearson's correlation will be used to correlate the analyzed biochemical parameters with PSS. Logistic regression will be used to determine the predictor of outcome.

Progression of the study

- We have selected and screened the sports players for the study,
- Perceived stress scale questionnaire is scored from the participants
- Then we have collected the blood sample for bio chemical investigation from 80 participants in DL Fitness studio (Adambakkam)
- Blood samples transported to SRM HOSPITAL for investigation
- Immediately fasting blood sugar and lipid profile analysed and serum separated
- Serum stored in -80 degree Celsius in our bio chemistry department (SRM COLLEGE)

Progression of the study

- Within one month period of time we have analysed the serum for insulin and cortisol using ELISA from bio chemistry department (SRM college)
- Then the participants are given regular HIIT AND PILATES for past four months where the participants are regularly monitored and assessed .
- Where after 16 weeks again the procedure of bio chemical investigation will be done to analyse the post test results

RESULT

VARIABLES	PRE TEST(MEAN $\pm$ SD)
Physiological variables	
Physical fitness	
Height	174.78 $\pm$ 7.120
Weight	74.35 $\pm$ 8.064
BMI	24.32 $\pm$ 2.098
Fat%	23.97 $\pm$ 4.452
Pre test HR	81.15 $\pm$ 3.795
Sub Max HR(220-Age)*85%	165.405 $\pm$ 5.779
HRA	147.58 $\pm$ 8.928
Speed	6.126 $\pm$ 0.470
VO2 Max	93.6 $\pm$ 1.699
W/H Ratio	0.80 $\pm$ 0.045
Girth(cm)	
W/AB/H/Arm/Thigh/Chest	102 $\pm$ 4.42

VARIABLES	PRE TEST(MEAN±SD)
Push UP	33.8±4.74
Crunches	40.02±10.51
Posture	
Biochemical Variables	
Cortisol	138.05±85.03
Fasting Blood Glucose	92.62±19.19
Insulin	1124.±9771.47
LDL-C	112.74±29.93
HDL-C	45.36±9.670
Triglyceride	123..07±237.01
Psychological Variables	
PSS Questionnaire score	4±2.09

EXAMS COMPLETED				
S.NO	CODE	DESCRIPTION	CREDIT	GRADE
1	RMM001	RESEARCH METHODOLOGY (MEDICAL AND HEALTH SCIENCE)	4	B
2	RPE17001	RESEARCH AND PUBLICATION ETHICS	2	B+
3	PPT810	EXERCISE PHYSIOLOGY AND ATHLETIC TRAINING	3	C
4	PPT831	TRAINING IMPACT ON SPORTS PLAYERS	3	C

References:

- **Marni N. Silverman and Patricia A. Deuster.** Biological mechanisms underlying the role of physical fitness in health and resilience. *Interface Focus*. 2014 Oct 6; 4(5): 20140040.
- **Anthony C Hackney.** Stress and the neuroendocrine system: the role of exercise as a stressor and modifier of stress. *Expert Rev Endocrinol Metab*. 2006 Nov 1; 1(6): 783–792
- **Lauren Thau; Jayashree Gandhi; Sandeep Sharma.** Physiology, Cortisol. *StatPearls*, 2022.
- **JE Clark.** The impact of duration on effectiveness of exercise, the implication for periodization of training and goal setting for individuals who are overfat, a meta-analysis. *Biol Sport*. 2016 Dec; 33(4): 309–333.
- **Anne Marie W. Petersen and Bente Klarlund Pedersen.** The anti-inflammatory effect of exercise. *J Appl Physiol* 98: 1154–1162, 2005.
- **Emma Childs and Harriet de Wit.** Regular exercise is associated with emotional resilience to acute stress in healthy adults. *Front. Physiol.*, 01 May 2014.
- **Florian Azad Engel, Alexander Ackermann, Hamdi Chtourou and Billy Sperlich.** High-Intensity Interval Training Performed by Young Athletes: A Systematic Review and Meta-Analysis. *Front. Physiol.*, 27 July 2018.
- **Monique E. Francois and Jonathan P. Little.** Effectiveness and Safety of High-Intensity Interval Training in Patients With Type 2 Diabetes. *Diabetes Spectr*. 2015 Jan; 28(1): 39–44.

References:

- **Yolanda Borrega-Mouquinho, Jesús Sánchez-Gómez, Juan Pedro Fuentes-García, Daniel Collado-Mateo and Santos Villafaina.** Effects of High-Intensity Interval Training and Moderate-Intensity Training on Stress, Depression, Anxiety, and Resilience in Healthy Adults During Coronavirus Disease 2019 Confinement: A Randomized Controlled Trial. *Front. Psychol.*, 24 February 2021.
- **Christine E. Di Lorenzo.** Pilates. *Sports Health*. 2011 Jul; 3(4): 352–361.
- **Gerald T Mangine, Jay R Hoffman, Adam M Gonzalez, Jeremy R Townsend, Adam J Wells, Adam R Jajtner, Kyle S Beyer, Carleigh H Boone, Amelia A Miramonti, Ran Wang, Michael B LaMonica, et al.** The effect of training volume and intensity on improvements in muscular strength and size in resistance-trained men. *Physiol Rep*. 2015 Aug; 3(8): e12472.
- **Ticiane Marcondes Fonseca da Cruz, Moisés Diego Germano, Alex Harley Crisp, Marcio Antonio Gonsalves Sindor.** Does Pilates Training Change Physical Fitness in Young Basketball Athletes?. *Journal of Exercise Physiology*. 2014, 17:1.
- **Ruchira Pangtey, Saurav Basu, Gajendra Singh Meena, and Bratati Banerjee.** Perceived Stress and its Epidemiological and Behavioral Correlates in an Urban Area of Delhi, India: A Community-Based Cross-Sectional Study. *Indian J Psychol Med*. 2020 Jan-Feb; 42(1): 80–86.
- **Nagaraj M. and Nithyanandan D.V.** Psychometric Properties Of The Tamil Version Of Cohen's Perceived Stress Scale. *Aegaeum Journal*, 2020, volume 8, Issue 9.

Patient Information Sheet:

Title of the project: Effect of Pilates and HIIT on Selected Physiological, Biochemical and Psychological Variable Among Sports Players.

Principal Investigator: Ms. Lavanya D.L, MPT (SPORTS), Department of Physiotherapy.

Guide: Dr. V.M. Vinodhini, MD (Bio), professor & HOD, Department of Biochemistry.

Co-Guide: Dr. K.Vaithianathan., Msc., MPed., Ph.D, Advisor, Department of Physical Education and Sports Sciences.

Purpose of this study/project:

To investigate the effect of pilates and HIIT with the physiological, biochemical and psychological changes among sports players.

Procedure/method of the study:

The physical fitness assessment, laboratory investigation and administration of questioners namely PSS will be done among the selected participants. The participants are subjected to pilates along with music and HIIT in an interval of 5 days for 16 weeks. After 16 weeks of pilates and HIIT again the physical fitness assessment, laboratory investigation and administration of questioners namely PSS will be done to compare the effects.

Sample collection: Following the aseptic protocol, 5 ml of venous blood sample will be collected in plain (red) and fluoride (gray) vacutainers. After analysing the sample for fasting serum glucose and lipid profile parameters the remaining sample will be stored in deep freezer at -20°C for further analysis.

HIIT: Before starting HIIT training the participants are subjected to Par-Q (Physical activity Readiness Questionnaires). The HIIT training starts with 8 or 12 minutes of walking test with constant speed. Then pushing to next level where the player gives maximum exertion to get maximal heart rate. At the end of this training VO₂ Max is calculated which gives player standard of fitness. The procedure is followed for next 16 week in an interval of 5 days.

Pilates: In Pilates, muscles are never worked to exhaustion, so there is no sweating or straining (just intense concentration). The workout consists of a variety of exercise sequences that are performed in low repetitions, usually 5 to 10 times, each three sets, over a session of 45 to 90 minutes. Mat work and specialized equipment for resistance are also used. Pilates will be accompanied with music without Lyrics.

Expected benefits: Reports will be given to the participants. The participants will not be charged for the investigations. Study parameters will be kept confidential. The study creates awareness among sports players to improve the physical fitness and to endurance their performance.

Any risks expected from the study: No risk is expected for the participants of study.

Compensation: No compensation will be provided as there is no risk participating in the study.

Address & contact of the principal investigator: 9884870345, SRM Institute of science and technology, Kattankulathur- 603203.

நோயாளியின் தகவல் தாள்:

ஆய்வின் தலைப்பு: “விளையாட்டு வீரர்களிடையே தேர்ந்தெடுக்கப்பட்ட உடலியல், உயிர்வேதியியல் மற்றும் உளவியல் மாறுபாட்டின் மீது பைலேட்ஸ் மற்றும் HIIT விளைவு” பற்றிய ஆய்வு.

முதன்மை ஆய்வாளர்: லாவண்யா டி.எல், MPT (ஸ்போர்ட்ஸ்), பிசியோதெரபி துறை

வழிகாட்டுனர்: டாக்டர் வி.எம். வினோதினி, MD (Bio), பேராசிரியர் & HOD, உயிர் வேதியியல் துறை.

இணை வழிகாட்டுனர்: டாக்டர் கே. வைத்தியநாதன்., Msc., MPed., Ph.D, ஆலோசகர், உடற்கல்வி மற்றும் விளையாட்டு அறிவியல் துறை

இந்த ஆய்வு/திட்டத்தின் நோக்கம்: இந்த ஆய்வின் நோக்கம் விளையாட்டு வீரர்களிடையே உடலியல், உயிர்வேதியியல் மற்றும் உளவியல் மாற்றங்களுடன் பைலேட்ஸ் மற்றும் HIIT இன் விளைவை ஆராய்வதாகும்.

படிப்பின் செயல்முறை/முறை: தேர்ந்தெடுக்கப்பட்ட பங்கேற்பாளர்களிடையே உடல் தகுதி மதிப்பீடு, ஆய்வக விசாரணை மற்றும் மனநல நிலையை அடையாளம் காண சுய-அறிக்கையிடப்பட்ட கேள்வித்தாள் அதாவது PSS அளவைப் பயன்படுத்தி மதிப்பிடப்படுவார்கள். பங்கேற்பாளர்கள் 16 வாரங்களுக்கு 5 நாட்கள் இடைவெளியில் இசை மற்றும் HIIT உடன் பைலேட்டுகளுக்கு உட்படுத்தப்படுகிறார்கள். 16 வார பைலேட்ஸ் மற்றும் HIITக்குப் பிறகு மீண்டும் உடல் தகுதி மதிப்பீடு, ஆய்வக விசாரணை மற்றும் சுய-அறிக்கையிடப்பட்ட கேள்வித்தாள் அதாவது PSS அளவை மதிப்பிடுவது ஆகியவை விளைவுகளை ஒப்பிட்டுப் பார்க்கப்படும். நெறிமுறையைப் பின்பற்றி, பங்கேற்பாளர்களிடமிருந்து 5 மில்லி இரத்த மாதிரி எடுக்கப்படும். குளுக்கோஸ் மற்றும் லிப்பிட் சுயவிவர அளவுருக்களுக்கான மாதிரியை பகுப்பாய்வு செய்த பிறகு, மீதமுள்ள மாதிரி கூடுதல் பகுப்பாய்வுக்காக ஆழமான உறைவிப்பான் -20 ° C இல் சேமிக்கப்படும்

- **HIIT:** HIIT பயிற்சியைத் தொடங்குவதற்கு முன், பங்கேற்பாளர்கள் Par-Q (உடல் செயல்பாடு தயார்நிலை கேள்வி)க்கு உட்படுத்தப்படுவார்கள். HIIT பயிற்சியானது நிலையான வேகத்துடன் 8 அல்லது 12 நிமிட நடைப்பயிற்சியுடன் தொடங்குகிறது. அதிகபட்ச வெப்ப வீதத்தைப் பெற பிளேயர் அதிகபட்ச உழைப்பை அளிக்கும் அடுத்த நிலைக்குத் தள்ளுங்கள். இந்த பயிற்சியின் முடிவில் VO2 மேக்ஸ் கணக்கிடப்படுகிறது, இது வீரரின் உடல் தகுதி தரத்தை அளிக்கிறது. 5 நாட்கள் இடைவெளியில் அடுத்த 16 வாரங்களுக்கு இந்த நடைமுறை பின்பற்றப்படுகிறது
- **பைலேட்ஸ்:** பைலேட்ஸில், தசைகள் ஒருபோதும் சோர்வடைவதில்லை, எனவே வியர்வை அல்லது வடிகட்டுதல் (வெறும் தீவிர செறிவு) இல்லை. வொர்க்அவுட்டில் பலவிதமான உடற்பயிற்சி வரிசைகள் உள்ளன, அவை பொதுவாக 5 முதல் 10 முறை, ஒவ்வொரு மூன்று செட்களிலும், 45 முதல் 90 நிமிடங்களுக்கு ஒரு அமர்வில் நிகழ்த்தப்படும். பாய் வேலை மற்றும் எதிர்ப்பிற்கான சிறப்பு உபகரணங்களும் பயன்படுத்தப்படுகின்றன. பைலேட்ஸ் பாடல்கள் இல்லாமல் இசையுடன் இருக்கும்.

பலன்களை எதிர்பார்க்கலாம்: பங்கேற்பாளர்களுக்கு அறிக்கைகள் வழங்கப்படும். விசாரணைக்கு பங்கேற்பாளர்களிடம் கட்டணம் வசூலிக்கப்படாது. ஆய்வு அளவுருக்கள் ரகசியமாக வைக்கப்படும். இந்த ஆய்வு விளையாட்டு வீரர்களிடையே உடல் தகுதியை மேம்படுத்தவும், அவர்களின் செயல்திறனை சகித்துக்கொள்ளவும் விழிப்புணர்வை ஏற்படுத்துகிறது.

ஆய்வில் இருந்து எதிர்பார்க்கப்படும் ஏதேனும் ஆபத்துகள்: ஆய்வில் பங்கேற்பவர்களுக்கு எந்த ஆபத்தும் இல்லை.

இழப்பீடு: ஆய்வில் பங்கேற்பதில் ஆபத்து இல்லை என்பதால் இழப்பீடு வழங்கப்படாது.

முதன்மை ஆய்வாளரின் முகவரி மற்றும் தொடர்பு: 9884870345, எஸ். ஆர். எம். மருத்துவக் கல்லூரி மருத்துவமனை மற்றும் ஆராய்ச்சி மையம், காட்டாங்குளத்தூர்- 603203.

Consent Form:

Effect of Pilates and HIIT on Selected Physiological, Biochemical and Psychological Variable Among Sports Players

Name : **Age** :

Occupation : **Contact No** :

Address :

I confirm that I have read and understood the information sheet dated _____ for the above study. I had the opportunity to ask questions and all the questions were answered to my satisfaction. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. I understand that the investigator and the ethics committee will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published. I agree not to restrict the use of any data or results that arise from this study provided that such a use is only for scientific purpose. I agree to take part in the above study.

Date:

Place:

Signature of the witness

Signature of the subject

Signature of the investigator

ஒப்புதல் படிவம்:

“விளையாட்டு வீரர்களிடையே தேர்ந்தெடுக்கப்பட்ட உடலியல், உயிர்வேதியியல் மற்றும் உளவியல் மாறுபாட்டின் மீது பைலேட்ஸ் மற்றும் HIIT விளைவு” பற்றிய ஆய்வு.

பெயர் :
வயது :
தொழில் :
முகவரி :
தொடர்பு எண் :

மேற்படி ஆய்வுக்கான _____ தேதியிட்ட தகவல் தாளைப் படித்துப் புரிந்துகொண்டேன் என்பதை உறுதிப்படுத்துகிறேன். கேள்விகள் கேட்க எனக்கு வாய்ப்பு கிடைத்தது, எல்லா கேள்விகளுக்கும் என் திருப்திக்கு பதில் கிடைத்தது. ஆய்வில் நான் பங்கேற்பது தன்னார்வமானது என்பதையும், எனது மருத்துவ பராமரிப்பு அல்லது சட்ட உரிமைகள் பாதிக்கப்படாமல், எந்தக் காரணமும் கூறாமல் எந்த நேரத்திலும் திரும்பப் பெற எனக்கு சுதந்திரம் உள்ளது என்பதையும் புரிந்துகொள்கிறேன். ஆய்வில் இருந்து விலகினாலும், தற்போதைய ஆய்வு மற்றும் அது தொடர்பாக நடத்தப்படும் எந்தவொரு ஆய்வும் எனது உடல்நலப் பதிவுகளைப் பார்ப்பதற்கு ஆய்வாளர் மற்றும் நெறிமுறைக் குழுவுக்கு எனது அனுமதி தேவையில்லை என்பதை நான் புரிந்துகொள்கிறேன். இந்த அணுகலை நான் ஒப்புக்கொள்கிறேன். இருப்பினும், மூன்றாம் தரப்பினருக்கு வெளியிடப்படும் அல்லது வெளியிடப்படும் எந்த தகவலிலும் எனது அடையாளம் வெளிப்படுத்தப்படாது என்பதை நான் புரிந்துகொள்கிறேன். இந்த ஆய்வில் இருந்து எழும் எந்தவொரு தரவு அல்லது முடிவுகளின் பயன்பாட்டைக் கட்டுப்படுத்த வேண்டாம் என்று ஒப்புக்கொள்கிறேன், அத்தகைய பயன்பாடு அறிவியல் நோக்கத்திற்காக மட்டுமே. மேற்கூறிய ஆய்வில் பங்கேற்க ஒப்புக்கொள்கிறேன்

தேதி:

இடம்:

சாட்சி கையொப்பம்

ஆய்வாளரின் கையொப்பம்

பங்கேற்பாளரின் கையொப்பம்

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the **last month**.In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

Name:

Date:

Age:

Gender (Circle): M F

0= Never 1 = Almost Never 2= Sometimes 3=Fairly Often 4=Very Often

1) In the last month, how often have you been upset because of something that happened unexpectedly?

0 1 2 3 4

2) In the last month, how often have you felt that you were unable to control the important things in your life?

0 1 2 3 4

3) In the last month, how often have you felt nervous and “stressed”?

0 1 2 3 4

4) In the last month, how often have you felt confident about your ability to handle your personal problems?

0 1 2 3 4

5) In the last month, how often have you felt that things were going your way?

0 1 2 3 4

6) In the last month, how often have you found that you could not cope with all the things that you had to do?

0 1 2 3 4

7) In the last month, how often have you been able to control irritations in your life?

0 1 2 3 4

8) In the last month, how often have you felt that you were on top of things?

0 1 2 3 4

9) In the last month, how often have you been angered because of things that were outside of your control?

0 1 2 3 4

10) In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

0 1 2 3 4

உணரப்பட்ட அழுத்த அளவுகோல்

இந்த அளவில் உள்ள கேள்விகள் கடந்த மாதத்தில் உங்கள் உணர்வுகள் மற்றும் எண்ணங்களைப் பற்றி கேட்கும். ஒவ்வொரு விஷயத்திலும் நீங்கள் எப்படி உணர்ந்தீர்கள் என்பதை வட்டமிடுங்கள்.

பெயர்:

தேதி:

வயது:

பாலினம்:

0= ஒருபோதும் இல்லை
அடிக்கடி

1 = கிட்டத்தட்ட எப்போதும் இல்லை

2 = சில நேரங்களில் 3=பெரும்பாலும்

4 =

1.கடந்த மாதம் எதிர்பாராத விதமாக நடந்த சம்பவங்களால் எத்தனை முறை கவலையாக இருந்தீர்கள்?

0 1 2 3 4

2. கடந்த மாதம் உங்கள் வாழ்க்கையில் நடந்த முக்கியமான விஷயங்களை உங்களால் கட்டுப்படுத்த முடியாமல் இருந்ததாக எத்தனை முறை உணர்ந்தீர்கள்?

0 1 2 3 4

3. கடந்த மாதம் எத்தனை முறை பதட்டமாகவும் , இறுக்கமாகவும் இருப்பதாக உணர்ந்தீர்கள் ?

0 1 2 3 4

4. கடந்த மாதம் எத்தனை முறை உங்களுடைய தனிப்பட்ட பிரச்சனைகளை சமாளிக்க மனதாரியம் உள்ளதென உணர்ந்தீர்கள்?

0 1 2 3 4

5. கடந்த மாதம் நீங்கள் நினைத்தது போல் அனைத்து செயல்களும் நடைபெற்றன என எத்தனை முறை உணர்ந்தீர்கள்?

0 1 2 3 4

6. கடந்த மாதம் உங்களால் செய்யப்பட வேண்டியிருந்த அனைத்து காரியங்களையும் உங்களால் ஈடுகொடுத்து செய்ய முடியாமல் போய்விட்டதாக எத்தனை முறை உணர்ந்தீர்கள் ?

0 1 2 3 4

7. கடந்த மாதம் எத்தனை முறை உங்கள் வாழ்க்கையில் எரிச்சலூட்டிய செயல்களை கட்டுப்படுத்த முடிந்தது?

0 1 2 3 4

8. கடந்த மாதம் எத்தனை முறை உங்கள் செயல்களில் உங்களை உயர்வாக நினைத்தீர்கள் ?

0 1 2 3 4

9. கடந்த மாதம் உங்களால் செய்யப்பட வேண்டியிருந்த அனைத்து காரியங்களையும் உங்களால் ஈடுகொடுத்து செய்ய முடியாமல் போய்விட்டதாக எத்தனை முறை உணர்ந்தீர்கள் ?

0 1 2 3 4

10. கடந்த மாதம் எத்தனை முறை உங்கள் வாழ்க்கையில் எரிச்சலூட்டிய செயல்களை கட்டுப்படுத்த முடிந்தது?

0 1 2 3 4

Thank You