

Original Research Article

Intensity Measurement of Physical Activity

Dr. Manish Parihar

Associate Professor, Department of Physiology, Dr. S.N. Medical College Jodhpur (RUHS), Rajasthan, India

*Corresponding author

Dr. Manish Parihar

Email: drmp100@gmail.com

Abstract: Physical inactivity is the biggest health problem of 21st century. Exercise is medicine and gives many health benefits if it is prescribed in form of frequency- intensity-time-type (FITT) that reverses aging process in many ways & add years to life. Haskell and Pollock US Department of Health and Human Services gave Classification of physical activity intensity based on physical activity lasting up to 60 minutes. Consent was taken from 80 subjects and their coaches for (10 subjects for each physical activity) at random those who cleared physical activity readiness questionnaire to estimate intensity by noting percentage of estimated maximum heart rate. (MHR = 220 - age in years); for that ;heart rate was observed by radial pulse within ten seconds then multiplied by six to get beat per minute just at the end of one hour of different type of physical activity. In my observation intensity range in form of percentage of maximum heart rate (MHR) for slow walking was 44.98% (light intensity range up to 49% of MHR), for volleyball 53.94%, for yoga 54.80%, for dance 56.78%, for brisk walking 64.98% (moderate intensity range 50-69% of MHR), for basketball 76.73%, for football 77.31%, for jogging 85.44% (hard intensity range 70-100% of MHR).

Keywords: Exercise is Medicine, Physical Activity Intensity, and Measurement

INTRODUCTION

Health Benefits Associated With Regular Physical Activity in Children and Adolescents ;Strong evidences are; Improved cardio-respiratory and muscular fitness, Improved bone health ,Improved cardiovascular and metabolic health biomarkers , Favorable body composition .Moderate evidences are Reduced symptoms of depression. In Adults and Older Adults Strong evidences are Lower risk of early death ,Lower risk of coronary heart disease, Lower risk of stroke, Lower risk of high blood pressure, Lower risk of adverse blood lipid profile, Lower risk of type 2 diabetes ,Lower risk of metabolic syndrome, Lower risk of colon cancer, Lower risk of breast cancer, Prevention of weight gain ,Weight loss, particularly when combined with reduced calorie intake ,Improved cardio-respiratory and muscular fitness, Prevention of falls, Reduced depression, Better cognitive function (for older adults). Moderate to strong evidences are; Better functional health (for older adults), Reduced abdominal obesity. Moderate evidences are Lower risk of hip fracture , Lower risk of lung cancer, Lower risk of endometrial cancer ,Weight maintenance after weight loss, Increased bone density, Improved sleep quality [1]. In view of the prevalence, global reach and health effect of physical inactivity, the issue should be

appropriately described as Pandemic, with far-reaching health, economic, environmental and social consequences.” Exercise is Medicine is a global initiative to establish physical activity as a standard in healthcare [2]. The scientific evidence demonstrating the beneficial effects of exercise is indisputable, and the benefits of exercise far outweigh the risks in most adults. A program of regular exercise that includes cardio-respiratory, resistance, flexibility, and neuromotor exercise training beyond activities of daily living to improve and maintain physical fitness and health is essential for most adults. The ACSM recommends that most adults engage in moderate-intensity cardio-respiratory exercise training for ≥ 30 min·d on ≥ 5 d·wk for a total of ≥ 150 min·wk, vigorous-intensity cardio-respiratory exercise training for ≥ 20 min·d on ≥ 3 d·wk (≥ 75 min·wk), or a combination of moderate- and vigorous-intensity exercise to achieve a total energy expenditure of ≥ 500 -1000 MET·min·wk. On 2-3 d·wk, adults should also perform resistance exercises for each of the major muscle groups, and neuromotor exercise involving balance, agility, and coordination. Crucial to maintaining joint range of movement, completing a series of flexibility exercises for each the major muscle-tendon groups (a total of 60 s per exercise) on ≥ 2 d·wk is recommended. The exercise

program should be modified according to an individual's habitual physical activity, physical function, health status, exercise responses, and stated goals. Adults who are unable or unwilling to meet the exercise targets outlined here still can benefit from engaging in amounts of exercise less than recommended. In addition to exercising regularly, there are health benefits in concurrently reducing total time engaged in sedentary pursuits and also by interspersing frequent, short bouts of standing and physical activity between periods of sedentary activity, even in physically active adults. Behaviorally based exercise interventions, the use of behavior change strategies, supervision by an experienced fitness instructor, and exercise that is pleasant and enjoyable can improve adoption and adherence to prescribed exercise programs. Educating adults about and screening for signs and symptoms of CHD and gradual progression of exercise intensity and volume may reduce the risks of exercise. Consultations with a medical professional and diagnostic exercise testing for CHD are useful when clinically indicated but are not recommended for

universal screening to enhance the safety of exercise [3].

METHOD

Observation was carried out at outside medical college at SMS Stadium, Chaugan Stadium, Central park & Buskers Dance Institute Raja Park at Jaipur; before starting physical activity; readiness questions [4] were asked to rule out any contraindication or any modification in physical activity. Consent was taken from 80 subjects and their coaches for (10 subjects for each physical activity) those who cleared physical activity readiness questionnaire to estimate intensity of physical activity by noting percentage of estimated maximum heart rate (220 – age in years); for that heart rate was observed by radial pulse within ten seconds then multiplied by six to get beat per minute just at the end of one hour of different type of physical activity. Haskell and Pollock US Department of Health and Human Services. Gave Classification of physical activity intensity based on physical activity lasting up to 60 minutes [5].

| Endurance - type activity | | | | | | | | | Strength-type exercise |
|---------------------------|---|------------------------|-------|--|---------------------|-------------|----------------|-------|---------------------------------|
| Intensity | Relative intensity | | | Absolute intensity (METs) in healthy adults (age in years) | | | | | Relative intensity |
| | VO ₂ max (%) heart rate reserve (%) | Maximal heart rate (%) | RPE | Young (20-39) | Middle aged (40-64) | Old (65-79) | Very Old (80+) | RPE | Maximal voluntary contraction % |
| Very light | < 25 | < 30 | < 9 | < 3.0 | < 2.5 | < 2.0 | < 1.25 | < 10 | < 30 |
| Light | 25-44 | 30-49 | 9-10 | 3.0 - 4.7 | 2.5-4.4 | 2.0-3.5 | 1.26-2.2 | 10-11 | 30-49 |
| Moderate | 45-59 | 50-69 | 11-12 | 4.8-7.1 | 4.5-5.9 | 3.6-4.7 | 2.3-2.95 | 12-13 | 50-69 |
| Hard | 60-84 | 70-89 | 13-16 | 7.2-10.1 | 6.0-8.4 | 4.8-6.7 | 3.0-4.25 | 14-16 | 70-84 |
| Very hard | > 85 | > 90 | > 16 | > 10.2 | > 8.5 | > 6.8 | > 4.25 | 17-19 | > 85 |
| Maximal* | 100 | 100 | 20 | 12.0 | 10.0 | 8.0 | 5.0 | 20 | 100 |

| S. No. | Physical Activity Type/Mode | No. of subjects (male) | Age in years (mean) | Estimated Maximum Heart rate 220-Age in years beat per minute (mean) | Observed heart rate beat per minute just at the end of one hour of physical activity (mean) | % of Maximum Heart rate bpm (Mean) | Intensity range of physical activity |
|--------|-----------------------------|------------------------|---------------------|--|---|------------------------------------|--------------------------------------|
| 1 | Slow walking | 10 | 25.2 yr. | 194.8 bpm | 87.6 bpm | 44.98 % | Light |
| 2 | Volleyball | 10 | 21.2 yr. | 198.8 bpm | 107.4 bpm | 53.94 % | Moderate |
| 3 | Yoga | 10 | 49.6 yr. | 170.4 bpm | 93.2 bpm | 54.80 % | Moderate |
| 4 | Dance | 10 | 20.5 yr. | 199.5 bpm | 113.2 bpm | 56.78 % | Moderate |
| 5 | Brisk walking | 10 | 29.4 yr. | 190.6 bpm | 123.6 bpm | 64.89 % | Moderate |
| 6 | Basketball | 10 | 14.9 yr. | 205.1 bpm | 157.4 bpm | 76.73 % | Hard |
| 7 | Football | 10 | 26.7 yr. | 193.3 bpm | 149.4 bpm | 77.31 % | Hard |
| 8 | Jogging | 10 | 23.1 yr. | 196.9 bpm | 168.0 bpm | 85.44 % | Hard |

RESULT

In this research; intensity range in form of percentage of maximum heart rate (MHR) for slow walking was 44.98% (light intensity range up to 49% of MHR), for volleyball 53.94%, for yoga 54.80%, for dance 56.78%, for brisk walking 64.98% (moderate intensity range 50-69% of MHR), for basketball 76.73%, for football 77.31%, for Jogging 85.44% (Hard intensity range 70-100% of MHR).

DISCUSSION

Training induced physiological adaptations depends primarily on intensity of overload. There are atleast seven different ways to express exercise intensity. (A) Energy expended per unit time in kcal/minute or kj/minute. (B) Absolute exercise level or power output kgm/minute or W. (C)Relative metabolic level expressed as a percentage of VO_2 Max.(D)Exercise below ,at or above the lactate threshold or Onset of Blood Lactate Accumulation (E) Exercise heart rate ,or percentage of maximum heart rate; can be used to classify exercise of relative intensity because % of VO_2 Max. And corresponding % of HR_{max} relate in a predictable way regardless of gender, race, fitness level, exercise mode or age. Aerobic Capacity improves if exercise intensity regularly maintains heart rate between 55% and 70% of Maximum Heart Rate (F) Multiples of resting metabolic rate MET (G) Rating of perceived exertion {RPE is psycho-physiological approach in which the exerciser rates on a numerical scale perceived feelings relative to exertion level. Monitoring and adjusting RPE during exercise provides an effective way to prescribe exercise from an individual's perception of effort that coincides with objective measures of physiologic/metabolic strain(% HR_{max} , % VO_2max , blood lactate concentration)} [6]. Talk test gives relative intensity; in which; A person who is active at a light intensity level should be able to sing while doing the activity. One who is active at a moderate intensity level should be able to carry on a conversation comfortably while engaging in the activity. If a person becomes winded or too out of breath to carry on a conversation, the activity can be considered vigorous or once your speech starts to break, slow, or cause discomfort, you're working at hard intensity range [7]. For many years, research focused on the best ways to develop and maintain cardio-respiratory fitness. Exercise frequency, intensity, type, and time (FITT) all influence the exercise prescription, but the most important variable remains exercise intensity. Experts cannot agree about which method best determines optimal exercise intensity for inducing a training response. The study by Karvonen and colleagues provided a simple method based on heart rate to gauge the minimum training threshold. The researchers' method for calculating Training HR, now known as the "Karvonen method" or "HR reserve method," applies the subject's exercise HR increase

above Resting HR to the range between Maximal HR and RHR. The following formula applies these data to establish THR at a percentage of training intensity (%TINT): $THR = [(MHR - RHR) \times \%TINT] + RHR$
The following formula computes %TINT at a known THR as follows: $\%TINT = (THR - RHR) \div (MHR - RHR) \times 100$

The researchers showed that when heart rate established training intensity, the "borderline" between effective and ineffective training slightly exceeded 60% of the percentage training intensity. The researchers recommended that THR must reach at least 60%TINT and preferably 70%TINT [8]. The concept of "fitness personality" has been a topic of growing interest in the past few decades, and recent findings suggest it can be used to open a dialogue with patients about their activity choices. Clinicians who understand how seven personality dimensions (sociability, spontaneity, self-motivation, aggressiveness, competitiveness, aggressiveness, mental focus, and risk taking) relate to various sports can help patients identify more satisfying activities. By using simple tools for matching personality types with activities, physicians may increase patient compliance with exercise prescriptions. Patients who complete a personality assessment may gain insights and additional motivation to pursue regular exercise and fitness for a lifetime [9]. Participation in very short- (less than 20 minutes/day or extended (more than 90 minutes/day) period of physical activity were linked with poorer health related quality of life. Physical activity promotes health or converse is true is a debatable topic [10]. Physical inactivity is the biggest health problem of 21st century [11]. Exercise physiology texted Five life style behaviors that add years to life. 1 Do not smoke 2 Drink moderately (no more than a glass of wine, a half a pint of beer, or one shot of; liquor per Day 3 Keep physically active, either on job or in leisure time 4 Eat five servings of fruits and vegetable daily 5 control body weight and blood pressure [12].

CONCLUSION

Exercise Prescription become wonderful drug if it is prescribed in form of frequency- intensity-time-type (FITT) that prolongs life, reverses aging process in many ways & add years to life.

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