Continuous And Intermittent Aerobic Training Repercussions On Psycho-Physiological Parameters In Adult Male

Dr. Jyoti Solanki, Assistant Professor (Physical Education), Government College for Girls, Sec-14, Gurugram, Haryana, India, E-mail:solankijyoti1@gmail.com

Dr. Vivek Solanki, Assistant Professor (Physical Education), Maharaja Surajmal Institute, New Delhi, India e-mail: drviveksolanki@gmail.com

ABSTRACT

The present study was conducted to assess the repercussions of Continuous and Intermittent Aerobic Training on Body Mass Index, Basal Metabolic Rate, Vo 2 Max., Self-esteem in College males. The objective of the study was to find out the repercussions of 30 minutes continuous aerobic workout and 15 minutes Intermittent Aerobic Training on Body Mass Index, Basal Metabolic Rate, Vo 2 Max., Self-esteem of sedentary male subjects for a total duration of twelve weeks. The study was formulated as an experimental design of twelve weeks training to find out the effect of two different methods of aerobic training on selected psycho-physiological parameters. The Pre- Post data was collected for the twelfth week of training. For the purpose of evaluating the effect of three different groups' one way ANOVA was employed. There were significant mean differences in Continuous group with Control and Intermittent groups. There were no significant mean differences in Continuous group with Intermittent and Control group and Intermittent with Control group. There were significant mean differences in Continuous with Control and Intermittent with Control group. There were significant mean differences in Continuous with Control and Intermittent with Control group. The improvement in the Continuous and Intermittent group did not reflect any significant differences with respect to improvement of performance on **Body Mass Index** variable, groups also did not reflect any significant differences with respect to improvement of performance on **Basal Metabolic Rate** variable, no significant differences with respect to improvement of performance on **Oxygen Consumption (VO. 2 Max)** variable was observed and improvement of performance on **Self Esteem** variable also did not reflect any significant differences .

Key word: Continuous Aerobic Training, Intermittent Aerobic Training, Basal Metabolic Rate, Body Mass Index, Maximal Oxygen Consumption, self-esteem.

INTRODUCTION

Advancement in technology during recent centuries has increased manifold and it is ever higher in the 21st century. Industrial research and development is entirely based on development of latest and more advanced technologies, to make human life healthier, increase longevity and happiness. In our 21st century we human beings are living in an era of overload technology and we are finding it difficult to find the answer

whether technology is a blessing or disguise to human beings now. Continuous technological inventions have taken humanity to a point where we are finding it difficult to absorb and technology is proving to be a disguise for survival of humans. No doubt, modern innovative methods have made our lives simpler, but due to this inactivity we are slowly moving towards an era of co- morbidities. Now the labor is more of mental, rather than physical which is slowly turning us towards a new pandemic i.e. lifestyle diseases.

An individual living sedentary lifestyle start's losing functionality of vital organs of the body overtime may it be cardio-vascular, locomotors, nervous system. Lack of physical activities is like an slow poison to human body, all the aspects of human body are meant to work and not just relax, may it be mental health, physical health or social health, with inventions of new gadgets life has become easier but body has to pay for it, long ago a famous economist Theodore Levitt has said that "Anything in excess is a poison" thus now new technological advancements are proving to be an curse to mankind. Lacks of physical activities are turning to be a pandemic very soon if we don't understand soon, Active lifestyle is the cheapest and most effective solution to this problem.

Been active and regular exercise regimes helps us in getting the body in shape and also in maintaining it. The only miracle to correct all this is only and only exercise, but its importance is fading with time or people are neglecting it, with increased ignorance towards health, we are losing it. Researchers have proven that active lifestyle has positive effects irrespective of age and gender. It is evident that to live healthy and happy lives we must be fit, live an active life. People living an active lifestyle are much happier, fall less sick, have less lifestyle diseases. It also enhances overall quality of life, while boosting quality of sleep, increased energy levels, better self-esteem and confidence. Exercise also decreases the risk of chronic diseases and psychological issues like stress, depression, dementia and Alzheimer's diseases.

Exercises are categorized as aerobic and anaerobic exercises. Aerobic exercises are those activities which require more oxygen while at rest over a long period of time, whereas un-aerobic exercises are those which are of short duration and require less oxygen. Body consumes carbohydrates, proteins and fats for energy production. Fats and carbohydrates produce more energy as compared to proteins and are termed as energy producing food, proteins contribute a small amount of total energy. Sedentary individual's use fat as the primary fuel, if the intensity of exercises is below 50-65% of VO2 max and if it increases above that carbohydrate become the primary fuel. Intensity of exercise, its duration, availability of fuel, status of training and environmental conditions is the deciding factors in fuel consumption. Intensity of workout influences the lipid oxidation process by restricting the fatty acid circulation into the blood and in mitochondria.

MATERIAL & METHODS:

The study was formulated as an experimental design of twelve weeks training to find out the repercussions of two different methods of aerobic training on selected psycho-physiological parameters i.e. Body Mass Index, Basal Metabolic Rate, and VO2Max. Self Esteem. Sixty-Five male subjects who were selected for the training were randomly assigned to three different groups namely—Continuous Aerobic Training as Experimental group –I (Twenty-Four subjects), Intermittent Aerobic Training as Experimental group -II (Twenty-Six subjects) & Control group (Fifteen subjects).

Continuous Group performed thirty minutes brisk walk and Intermittent Group performed two fifteen minutes short bout on high intensity were given three days training per week for twelve weeks duration. The control group was not exposed to any training programme.

The intensity of walking programme for thirty minutes of continuous aerobic training group was based on calculating the MET value and for the present study MET value for initial week to fourth week was 4.5 and thereafter increased to 5.5 from fifth week to eighth week and finally 6.5 from ninth week to twelfth week of training. (Jack H. Willmore & David L. Costill 2004). The intermittent training group was exposed to a different regime with higher levels of intensity but shorter duration (fifteen minutes) of continuous workout. This training program consisted of walking on a low to medium intensity followed by an all-out effort. The program was based on the principles of work-recovery ratio of 1:6, 1:5, 1:4 to 1:3 (Bompa 2000) where one represents the all-out effort and three, four, five and six numerals represent the number of times the work effort.

RESULTS:

To find out the repercussions of twelve weeks of continuous and intermittent aerobic training on selected Psycho-Physiological parameters in Adult males. The one way ANOVA were calculated which are presented in the table below:-

Table-1 ANOVA Used As A Post-Hoc For The Interaction on Various Psycho-Physiological Variables as a Result of Twelve Weeks of Aerobic Training

	Sum of Squares	Df	Mean Square	F	Sig.
Body Mass Index					
Between Groups	3.253	2	1.627	24.390	**0.000***
Within Groups	4.135	62	.067		
Total	7.388	64			
VO2 Max.					
Between Groups	2506.553	2	1253.276	34.409	**0.000***
Within Groups	2258.229	62	36.423		
Total	4764.782	64			
Basal Metabolic Rate					
Between Groups	391.185	2	195.593	0.398	0.673
Within Groups	30437.276	62	490.924		
Total	30828.462	64			
Self Esteem					
Between Groups	116.026	2	58.013	5.660	**0.006***
Within Groups	635.513	62	10.250		
Total	751.538	64			

It is evident from above table no.-01 that there were no significant differences between three groups of training namely: Continuous training, intermittent training and Control group on the **Basal Metabolic Rate** parameter whereas remaining three parameters were found to be statistically significant. We can now report the one way ANOVA for all psycho-physiological parameters which were statistically significantly different at the p value of 0.05 (P < 0.0005). This is also indicated by an asterisk mark.

From the results above it is evident that there are significant differences between the groups as a whole. The Scheffe post-hoc test is generally the preferred test for conducting post-hoc tests on a one-way ANOVA and the tables from 2 to 5 below indicate the multiple comparisons on selected psycho-physiological parameters at different stages of twelve weeks of training with respect to different groups.
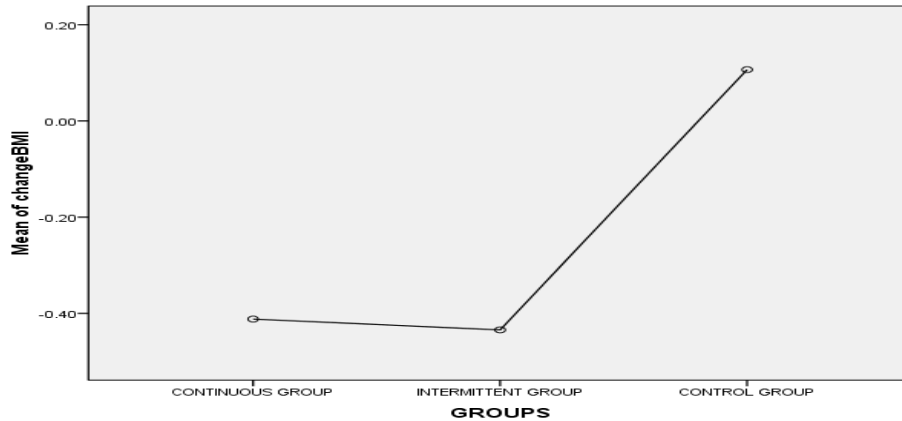
Table-02 Multiple comparisons for Body Mass Index at different stages of twelve weeks of Aerobic Training among groups

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Continuous	Intermittent	0.02253	0.07310	0.954	-0.1608	0.2059
	Control	-0.51875*	0.08500	**0.000***	-0.7319	-0.3056
Intermittent	Control	-0.54128*	0.08373	**0.000***	-0.7513	-0.3313

*. The mean difference is significant at the 0.05 level.

From the above table no.-02, The Scheffe test shows that there is a significant mean difference in Continuous with Control group (p=.000) and Intermittent with Control group (p=.000). However, statistically speaking, the improvement in the Continuous and intermittent group did not reflect any significant differences with respect to improvement of performance in each group. The mean of change scores has been illustrated graphically in figure 01.

Figure-01 Means of Body Mass Index difference of Pre-Post test data of Twelve weeks of Aerobic Training among Groups

The above figure clearly indicates that there were improvements found with respect to Continuous and Intermittent group; whereas the Control group did not show any improvement further it also depicts that the aerobic training of the intermittent group reflected maximum change in the Body Mass Index (BMI) variable in comparison to Continuous and Control group.
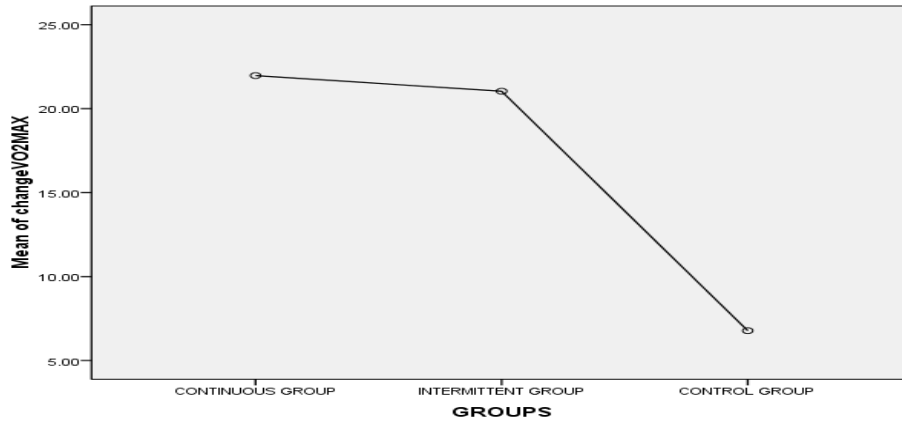
Table-03 Multiple comparisons for Maximal Oxygen Consumption (VO2 Max) at different stages of twelve weeks of Aerobic Training among groups

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Continuous	Intermittent	0.93064	1.70837	0.862	-3.3541	5.2154
	Control	15.19100*	1.98641	**0.000***	10.2089	20.1731
Intermittent	Control	14.26036*	1.95681	**0.000***	9.3525	19.1682

*. The mean difference is significant at the 0.05 level.

From the above table no.-03, The Scheffe test shows that there is a significant mean difference in Continuous with Control group (p=.000) and Intermittent with Control group (p=.000). However, statistically speaking, the improvement in the Continuous and intermittent group did not reflect any significant differences with respect to improvement of performance in each group. The mean of change scores has been illustrated graphically in figure 02.

Figure-02 Means of VO2 Max difference of Pre-Post test data of Twelve weeks of Aerobic Training among Groups

The above figure clearly indicates that there were improvements found with respect to Continuous and Intermittent group; whereas the Control group did not show any improvement further it also depicts that the aerobic training of the Continuous group reflected maximum change in the Maximal Oxygen Consumption (Vo2 Max.) variable in comparison to Intermittent and Control group.
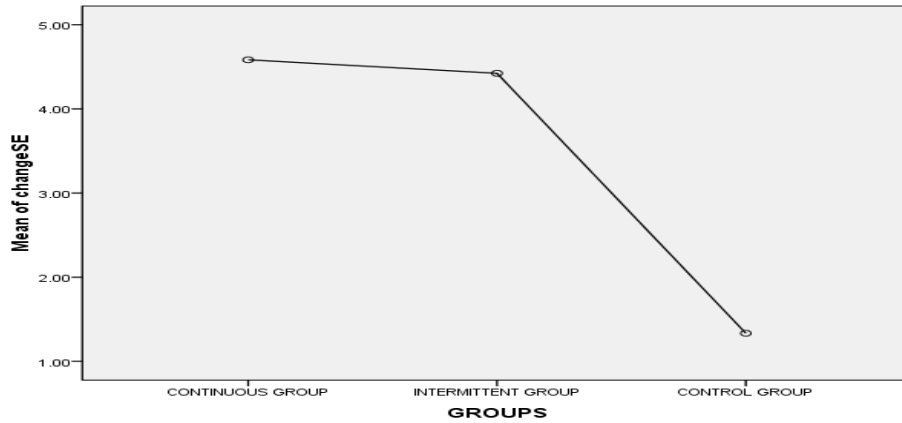
Table-04 Multiple comparisons for Basal Metabolic Rate (BMR) at different stages of twelve weeks of Aerobic Training among groups

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Continuous	Intermittent	4.86218	6.27191	0.742	-10.8683	20.5927
	Control	-0.35833	7.29270	0.999	-18.6491	17.9324
Intermittent	Control	-5.22051	7.18401	0.769	-23.2386	12.7976

*. The mean difference is significant at the 0.05 level.

From the above table no.-4, The Scheffe test shows that there is not significant mean difference in Continuous with Intermittent and Control group, and Intermittent with Continuous and Control group. However, statistically speaking, the improvement in the Continuous, Intermittent and Control group did not reflect any significant differences with respect to improvement of performance in each group. The mean of change scores has been illustrated graphically in figure 03.

Figure-03 Means of Self Esteem difference of Pre-Post test data of Twelve weeks of Aerobic Training among Groups

The above figure clearly indicates that there were improvements found with respect to Continuous and Intermittent group; whereas the Control group did not show any improvement further it also depicts that the aerobic training of the Continuous group reflected maximum change in the Self Esteem (SE) variable in comparison to Intermittent and Control group.

Table-5 Multiple comparisons for Self Esteem at different stages of twelve weeks of Aerobic Training among groups

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Continuous	Intermittent	0.16026	0.90627	0.984	-2.1128	2.4333
	Control	3.25000*	1.05377	**0.012***	0.6070	5.8930
Intermittent	Control	3.08974*	1.03807	**0.016***	0.4862	5.6933

*. The mean difference is significant at the 0.05 level.

From the above table no.-5, The Scheffe test shows that there is a significant mean difference in Continuous with Control group (p=.012) and Intermittent with Control group (p=.016). However, statistically speaking, the improvement in the Continuous and intermittent group did not reflect any significant differences with respect to improvement of performance in each group. The mean of change scores has been illustrated graphically in figure 04.

Figure-04 Means of Self Esteem difference of Pre-Post test data of Twelve weeks of Aerobic Training among Groups
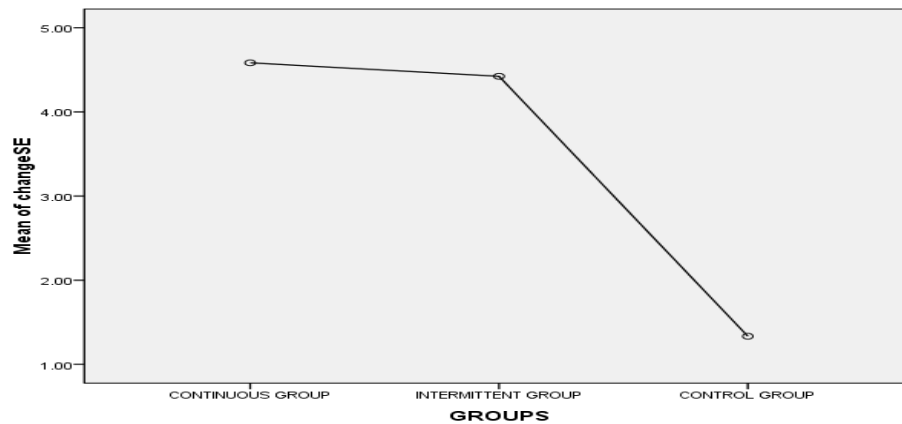
The above figure clearly indicates that there were improvements found with respect to Continuous and Intermittent group; whereas the Control group did not show any improvement further it also depicts that the aerobic training of the Continuous group reflected maximum change in the Self Esteem (SE) variable in comparison to Intermittent and Control group.

DISCUSSION:-

There were significant mean differences in Continuous with Control, and Intermittent with Control group of **BMI, Vo2 Max., Self Esteem** variable, but there were no significant mean differences in Continuous group with Intermittent and Control group, and Intermittent with Control group of **BMR**. The reason for this may be the intensity of training was not that much effective and the BMR of the subjects already not so high. Research during 1992 and 1997 states that individual aerobic fitness levels are not related with resting metabolism. Studies show that aerobic athleticism does not increase the predictive power of fat free mass for metabolic rate during rest. BMR can be enhanced by anaerobic exercises like weight training, which increases muscle mass and ultimately fat-free mass improves in individuals, Although, the effects on BMR is tendentious.

Elongated stress can decrease BMR levels by hampering the functioning of the digestive system. Stress has both positive, as well as negative effects on our metabolism. Inadequate sleep can also increase our BMR levels. Reduced stress levels and quality sleep will increase the BMR levels. In this competitive world it's true that it's not an essay to decrease the stress levels that can cause certain ulcers and ulcerative colitis. Decreased stress levels can improve the Basal metabolism and overall body parameters. However, statistically speaking, the improvement in the Continuous and intermittent group did not reflect any significant differences with respect to improvement of performance in all variables.

The consequence for the study reflects significant decline among **BMI in** Continuous Training & Intermittent Training groups. It has been observed earlier also that, high intensity exercises which results in massive increase in aerobic fitness and thus more oxidation of fat (Tremblay et al. 1994; King et al. 2001, 2002) would be required to bring changes in body composition in the Intermittent and Continuous groups. However, there was no change in VO2 max. among Control Groups when compared to the Intermittent and Continuous groups. The present study revealed a significant increase in the Vo2 max following 12 weeks of continuous and intermittent training.

Numerous studies have proven that there was an increase in VO2 max after exercises of higher intensity as compared to exercises of low intensity (King et al. 2001; O' Donovon et al. 2005; Schmidt et al. 2001; Hawley 2001; Rahimi 1996; Tabata et al. 1980; DeBusk et al. 2004; Murtagh et.al. 2005; Helgerud 2007; Tabata et.al. 1996; Tanisho 2009; Gormley 2008; Mayer 2001;Zafeiridis et al. 2010; Macfarlane et al. 2006; Borel& Benoit 2010; Guiraud**et al.** 2010; Tanisho**etal.** Thevenet**et al.** 2007; Marra. et.al. 2005; Kalliokoski, & Nuutila 2001; Cramer **et al.** 1990) whereas as the energy levels were same between interventions, exercises of higher intensity places a greater overload on the cardiopulmonary system.

Existing literature says that brisk walking improves aerobic fitness, whereas this study disagrees with this. Heart pumping capacity limits the VO2 max and rest periods during interval training helps an individual to complete short work periods at higher intensities, this philosophy of interval training is evidently suggested. Meta-analysis of one million adults shows that in the longer term blood pressure lowering of this magnitude would be linked with ≈40% and 30% less cases of premature death from stroke and ischemic heart disease.

It is quite evident that exercise has a positive influence on self-esteem. Lower self-esteem individuals have more formidable influence. Research has proven that aerobic exercise has noticeable effects than anaerobic exercises; it may be due to less literature available on resistance training exercise and self-esteem. Moreover, studies have shown that self-esteem is more complex and its subcomponents like sport competence, physical condition, body image and strength all have an effect on self-esteem. Stress can be managed more easily by fit individuals rather than unfit individuals.

CONCLUSIONS:

In light of the limitations and as a result of exposing the subjects to two different training methods namely: Continuous and Intermittent Training groups and comparing it with the control group, of twelve weeks of training program the following conclusions were drawn in relation to its effect on various psycho-physiological parameters:

1.   There were significant mean differences in Continuous group with Control and Intermittent with Control group. However, statistically speaking, the improvement in the Continuous and Intermittent group did not reflect any significant differences with respect to improvement of performance on **Body Mass Index** variable.

2.   There were no significant mean differences in Continuous group with Intermittent and Control group and Intermittent with Control group. However, statistically speaking, the improvement in all groups did not reflect any significant differences with respect to improvement of performance on **Basal Metabolic Rate** variable.

3.   There were significant mean differences in Continuous with Control and Intermittent with Control group. However, statistically speaking, the improvement in the Continuous and intermittent group did not reflect any significant differences with respect to improvement of performance on **Oxygen Consumption (VO2 Max)** variable.

4.   There were significant mean differences in Continuous with Control and Intermittent with Control group. However, statistically speaking, the improvement in the Continuous and intermittent group did not reflect any significant differences with respect to improvement of performance on **Self Esteem** variable.

REFERENCES:-

Bompa (2000). 'Total Training for Young Champions' Human Kinetics, 2000.

Jack H. Wilmore, David L. Costill (2004). 'Physiology of Sports and Exercise,: Human Kinetics, 2004

Pollock M.L., Matthew S. Feigenbaum, & William F. Brechue. Exercise Prescription for Physical Fitness, (1995) American Academy of Kinesiology and Physical Education, QUEST, pp.47, 320-337

Alpert, Bené, Tiffany M., Goldstein Sheri, Perry, & Susan. (1990). 'Aerobics Enhances Cardiovascular Fitness And Agility In Preschoolers'; Health Psychology; Vol. 9 (1), 48-56.
doi: 10.1037/0278-6133.9.1.48

Borel, Benoit, Leclair, Erwan, Thevenet. (2010). 'Correspondences Between Continuous and
Intermittent Exercises Intensities in Healthy Prepubescent Children'; European Journal of Applied Physiology; 108 (5): 977-85.

Cramer R., Sylvia, David, C., Nieman, & Jerry W. Lee. (1990). 'The effects of moderate exercise training on psychological well-being and mood state in women'; Journal of Psychosomatic Research; Volume 35, Issues 4–5, 1991, Pages 437–449.

DeBusk F., Robert, Stenestr and Mary, Sheehan., William, L, Haskell., (2004). 'Training effects of long versus short bouts of exercise in healthy subjects'; The American Journal of Cardiology' Volume 65, Issue 15, Pages 1010–1013.

Fentem, P., H. (1992). Exercise in prevention of disease. British medicine Bulletin, 48, 630-650.

Guiraud, Thibaut. Juneau, Martin. Nigam, & Anil. Gayda, (2010). 'Optimization of High Intensity Interval Exercise in Coronary Heart Disease'; European Journal of Applied Physiology; 108(4):733-40.

Hassmen, P., Koivula, N., & Uutela, A. (2000). 'Physical exercise and psychological well-being: A population study in Finland'; Preventative Medicine; 30 (1), 17–25.

Howley, E.T. (2001). 'Type of activity: resistance, aerobic and leisure versus occupational physical activity'; Medicine Science in Sports & Exercise; 33 (Suppl 6): S 364-9.

Helgerud, J., Hoydal, K., Wang, E., et al. (2007). 'Aerobic high-intensity intervals improve VO2max more than moderate training'; Medicine Science in Sports & Exercise; 39(4):665-71.

Kalliokoski, Nuutila et al. (2001). 'Relationship between muscle blood flow and oxygen uptake during exercise in endurance training and untrained men'; Journal of Applied Physiology; Vol. 98 no.1, pp. 380-383.

King, A.C., Blair, S.N., Bild, D.E., Dishman, R.K., Dubbert, P.M. et al. (1992). 'Determinants of physical activity and interventions in adults Medicine Science in Sports & Exercise. 24:S221-S236.

Macfarlane J., Duncan, Taylor H., Lynne & Cuddihy F., Thomas (2006).Very short intermittent Vs continuous bouts of activity in sedentary adults'; The University of Hong Kong, Pokfulam, Hong Kong.

Marra, C., Bottaro, M., Oliveira, R.J., & Novaes J.S. (2005) 'Effect of Moderate and High Intensity Aerobic Exercise on The Body Composition of Overweight Men'; Official

Research Journal of the American Society of Exercise Physiologists (ASEP); 8(2):39-45.ISSN 1097-9751

Meyer, T., Auracher, M., Heeg, K., Urhausen, A., & Kindermann, W. (2006). 'Does culminating endurance training at the weekends impair training effectiveness?' European Journal of Cardiovascular Prevention Rehabilitation; 13 (4): 578-84.

Murtagh M., Elaine, Boreham A.G., Colin, Alan Nevill, Lesley G., Hare, Marie H. Murphy. (2005). 'The effects of 60 minutes of brisk walking per week, accumulated in two different patterns, on cardiovascular risk'; Preventive Medicine; Volume 41, Issue 1, pp. 92–97

O'Donovan, G., Kearney, E,M., Nevill, A,M., Woolf-May, K., & Bird ,S,R. (2005). 'The effects of 24 weeks of moderate- or high-intensity exercise on insulin resistance'; European Journal of Applied Physiology; 2005; 95 (5-6): 522-8.

Schmidt W. Daniel, Craig, J. Biwer, & Linda, K. Kalscheuer. (2001). 'Effects of Long versus Short Bout Exercise on Fitness and Weight Loss in Overweight Females'; Journal of the American College of Nutrition; Vol. 20, No. 5, 494-501.

Scully, D., Kremer, J., Meade, M.M., Graham, R., & Dudgeon. (1998). 'Physical Exercise and Psychological Well Being: A Critical Review'; British Journal of Sports Medicine; 32, 111-120., 1998, Northern Ireland.

Sonstroem RJ., Morgan WP (1989). 'Exercise and self-esteem: rationale and model'; Med. Sports exercise; 1989 Jun; 21(3):329-37.

Tabatai, I., Nishimura, K., & Kouzaki, M. (1996), 'Effects of Moderate-Intensity Endurance and High-Intensity Intermittent Training on Anaerobic Capacity and VO2 max'; National Institute of Fitness and Sports; vol. 28, no.10, pp. 1327-1330.

Tanisho, K., & Hirakawa, K. (Nov 2009) 'Training effects on endurance capacity in maximal intermittent exercise: comparison between continuous and interval training'; Journal of Strength & Conditioning Research'; 23(8):2405-10.

Tomlin, D.L., Wenger, H.A. (2001). 'The Relationship between Aerobic Fitness and Recovery from High Intensity Intermittent Exercise'; Journal of Sports Medicine; Canada; 31 (1):1-11

Zafeiridis, Andreas, Sarivasiliou, H., Dipla, K., Vrabas, I. S. (2010). 'The Effects of Heavy Continuous Versus Long and Short Intermittent Aerobic Exercise Protocols on Oxygen Consumption, Heart Rate, and Lactate Responses In Adolescents'; European Journal of Applied Physiology; 110(1):17-26.

Websites:

https://en.wikipedia.org/wiki/Basal_metabolic_rate
http://www.weightlossforall.com/metabolic-changes.htm
http://www.mydr.com.au/sports-fitness/aerobic-exercise-the-health-benefits
http://www.nhs.uk/Livewell/fitness/Pages/whybeactive.aspx