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Effect of Different Module of Walking Interventions on Health Related Physical Fitness of Middle Aged People

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Abstract

Aim: *The purpose of the present experimental study was to find out the best walking intervention protocol which would have significant effect on health related physical fitness of the middle aged people.* ***Methodology:*** *Total 32 subjects have been selected purposively and divided randomly in equal numbers in four groups. Three experimental groups namely Experimental Group 1 (EG -1), Experimental Group 2 (EG -2), and Experimental Group 3 (EG -3), have gone through three different walking protocol for 12 weeks designed with different intensity and volume of walking; whereas the Control Group (CG) did not get any training. Three components of health related physical fitness namely cardio-respiratory endurance, muscular strength and endurance and body fat percentage has been tested through 12 Minute walk/run, one minute bent knee sit ups and skinfold measurement respectively. ANCOVA has been applied to find out the differences among the groups at 0.05 level of significance. LSD test has been applied to find out the best walking protocol.* ***Result & Conclusion:*** *The statistical findings of mean score of pre and post test mean scores have revealed the fact that all the three walking protocol has significantly improved the selected health related physical fitness components. The walking protocol III has been proved to be best protocol may be because of its gradual increase of intensity of speed with fixed distance covered in lesser duration after every four weeks of training.*

Key Words: Module, Intervention, Protocol, Health-related fitness.

Introduction:

Aging is a normal phenomenon of human life and it will come in everyone's life sooner or later. This aging process can be delayed through leading a healthy lifestyle, following balanced diet, avoiding smoking and drinking and most importantly by participating in different kind of regular physical interventions programmes (Harridge & Lazarus, 2019).

The middle age of our life span starts from the age of 40 and continues till 65 where the people face various kinds of obstacles which would have some negative effect on physical and psychological health (Yaffe & Stewart, 1984). The strength and functioning of the body decreases and the individual face various chronic conditions like cardio-vascular diseases, diabetes, hypertension, cancer, obesity, stress, anxiety etc. (My Library, n.d) which effects the quality of life at the later part specially at the old age (Lee et al., 2013).

Some short of physical activity have proved to be beneficial in this regard as it helps to maintain healthy body weight, keeps the individuals away from various kinds of diseases, and develops immune system

(Kokkinos, 2012). Findings of various experimental researches have proved that moderate level of regular exercise programme is very much beneficial in improving quality of life (Ellingson, 2000) as it enhances the general functioning of various systems of the body (Courneya et al., 2002; Grimm et al., 1997). Besides these, the exercise programmes are also proved to be beneficial in the improvement of psychological fitness (Rippe et al., 1998) as it helps to reduce stress, tension, depression and anxiety etc. (Dunn et al., 2001).

Among various physical activity programmes America College of Sports Medicine (2000) recommended regular aerobic activities for middle aged. Among various aerobic activity programmes walking have been proved to be beneficial (Serwe, 2011) in the development of overall health of an individual (Amiri et al., 2013).

It is not necessary to do strenuous physical activity to get health benefits, but moderate amount of physical activities also can have different kind of health benefits. So the walking programmes also can be of different intensity and volume. The researches have proved that continuous walking interventions with moderate intensity have proved to be benefical in the improvement of aerobic fitness (Woolf-May et al., 1999) whereas the walking interventions based on single bout with bit high intensity have proved to be helpful in improvement and control of BMI (Murphy et al., 2006). In spite of multiple benefits of different walking interventions, these are very much beneficial for those people who can't spend much time for exercise beside their normal office work (Taylor et al., 2004; Pelssers et al., 2013).

So it is clear from the above facts that with different intensity and volume the walking interventions are providing different kind of health benefits. Though the existing researches are not providing sufficient evidences regarding the correct intensity, duration, volume of walking interventions which can be recommended unanimously for every middle aged people.

So the present researchers have intended to find out the correct combination of intensity, duration, volume etc. among three different walking protocols, which could be beneficial for health related physical fitness of middle aged people.

Aim & Objectives:

The aim of the study was to find out the effect of three different walking protocols on health related physical fitness of middle aged people.

Methods and materials:

Selection of Subjects: Initially the researchers have selected forty (40) male persons aged 40 to 60 years from Santiniketan and Bolpur area, Birbhum, West Bengal, India. Their height and weight has been taken and BMI has been calculated. Those who have the BMI of 25 kg/mt^2 they have only been selected for the purpose of the study. Finally thirty two (32) subjects have been selected purposively. They have been randomly put into four (04) different groups of equal numbers of participants as per the following details shown in table 1.

Table - 1

Grouping of selected subjects

Groups	No. of subjects
Experimental Group-I (EG I)	08
Experimental Group-II (EG II)	08
Experimental Group-III (EG III)	08
Control Group (CG)	08
Total	32

Selection of Variables: For the purpose of the study the following variables and their established testing tools have been selected and shown in table – 2.

Table – 2

Variables and Tools Selected

Parameter	Name of the Variables	Testing Tools	Measuring Unit	Instruments Used
Health Related Physical Fitness	Muscular Strength and Endurance	1 minute Bent knee sit-ups	Total Number	Stop watch, Floor Mat
	Cardio-Respiratory Endurance	12-min run & walk	Meter	Measuring tape, Stop watch and Starting device
	Body fat Percentage	(495 / Body Density) – 450 (Jackson & Pollock, 1980)	Percent	Standard Harpenden Skinfold Caliper

Study Design: All the subjects have been tested at the baseline i.e. before starting of the training on the selected health related physical fitness variables. Then the three Experimental groups have been put into three different walking protocols for six days per week (6 days/week) for 12 weeks and the control group has not been given any kind of training, they have only gone through their normal routine work for entire training period. To measure the walking steps, duration and total distance traveled by the subjects the researchers have used sophisticated Yamax CW-701 Digi-Walker Pedometer, made in Japan as this instrument has been found to be accurate and widely used by different researchers. All the groups including the control groups again have been tested on the same variables after 12 weeks i.e. at the end of the training. The detailed training protocols are shown in Table – 3.

Table – 3

Walking Intervention Protocol

Protocol & Group	Weeks	1st four weeks	2nd four weeks	Last 4 weeks
Walking Protocol-I for EG I	Duration	40 minutes/day	40 minutes/day	40 minutes/day
	Speed	120 steps/min.	130 steps/min.	140 steps/min.
	Targeted steps/day	4800 steps/day	5200 steps/day	5600 steps/day
Walking Protocol-II for EG II	Duration	30 minutes/day	40 minutes/day	50 minutes/day
	Speed	120 steps/min.	130 steps/min.	140 steps/min.
	Targeted steps/day	3600 steps/day	5200 steps/day	7000 steps/day
Walking Protocol-III for EG III	Duration	50 minutes	45 minutes	40 minutes/day
	Speed	120 steps/min.	133 steps/min.	150 steps/min.
	Targeted steps/day	6000 steps/day	6000 steps/day	6000 steps/day
Control Group	No Training			

Statistical Tools Used: To find out the prominence and dominance of data the descriptive statistics i.e. mean, standard deviation has been used predominantly for pretest as well as posttests score.

To find out the effectiveness of different walking protocols for the improvement of health related physical fitness variables the analysis of covariance (ANCOVA) was used.

To find out the best walking protocol the pair wise mean comparison has been done through least significant differences (LSD) Post- hoc test.

The spread of the data has been shown through graphical representation.

The significance has been tested at 0.05 level of significance.

Result:

Table – 4

Descriptive Statistics of Health Related Physical Fitness Components of Pre and Post Test of Experimental Groups and Control Groups

Variables		EG – 1		EG – 2		EG – 3		CG	
		Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test
Cardio-Respiratory Endurance	Mean	1.16	1.42	1.23	1.57	1.23	1.58	1.16	1.23
	SD	0.07	0.06	0.10	0.15	0.08	0.10	0.05	0.24
Muscular Strength & Endurance	Mean	10.50	14.38	14.63	18.5	12.13	16.13	10.13	10.38
	SD	2.00	2.26	5.01	5.40	1.73	2.36	1.13	2.07
Body fat Percentage	Mean	28.58	24.76	27.37	22.95	29.15	23.92	29.46	29.96
	SD	4.79	4.61	2.43	1.85	1.70	1.40	3.07	2.82

Table 4 is showing the mean and standard deviation result found from pre and post test scores of selected three health related physical fitness variables i.e. Cardio-Respiratory Endurance, Muscular Strength & Endurance and Body fat Percentage of three Experimental Groups and Control Group.

Table 5
Analysis of Covariance of the Means among Three Experimental Groups and Control Group on Cardio-Respiratory Endurance

Source of Variations	d.f	SS	MSS	F
Between Groups	3	0.424005396	0.141335132	**6.468476***
Within Groups	27	0.589945552	0.021849835	

*Significant at 0.05 Level. Tab F.05 (3,27) = 2.95

Table 5 is showing that the calculated 'F' value 6.46847 is greater than the tabulated 'F' value 2.95, so it can be concluded that there is a significant difference among all the three experimental groups and control group as per as the cardio-respiratory endurance is concerned at 0.05 Level of significance.

To find out the best training protocol for the improvement of cardio-respiratory endurance pairwise comparisons among adjusted means has been done through Least Significance Differences (LSD) test.

Table 6
Pair wise Mean Comparison (LSD) among Three Experimental Groups and Control Group on Cardio-Respiratory Endurance

Adjusted Means of Different Groups				MD	CD (0.05 Level)
EG -1	**EG - 2**	**EG - 3**	**CG**		
1.446819315	1.543814203			0.09699	**0.15151232**
1.446819315		1.554581238		0.10776	
1.446819315			1.247535244	0.199284*	
	1.543814203	1.554581238		0.01077	
	1.543814203		1.247535244	0.296279*	
		1.554581238	1.247535244	0.307046*	

*Significant at 0.05 Level.

The result of LSD test visible at table 6 shows that there is no significant difference among the walking protocol of EG – 1, EG – 2 and EG – 3 as the mean difference values of these three groups are lesser than the critical difference value at 0.05 level of significance. Although all the Experimental Groups are found to be significantly different and superior than the Control Group as the mean difference values of EG -1 and CG i.e. 0.199284, EG – 2 and CG i.e. 0.296279, EG – 3 and CG i.e. 0.307046 are greater than the critical difference value i.e. 0.15151232.

So it can be concluded that for the improvement of cardio-respiratory endurance all the three walking protocols are effective. Out of these walking protocols the protocol of EG – 3 is best followed by EG – 2 and EG – 1.

The difference between pre and post test scores has been presented in Figure 1.

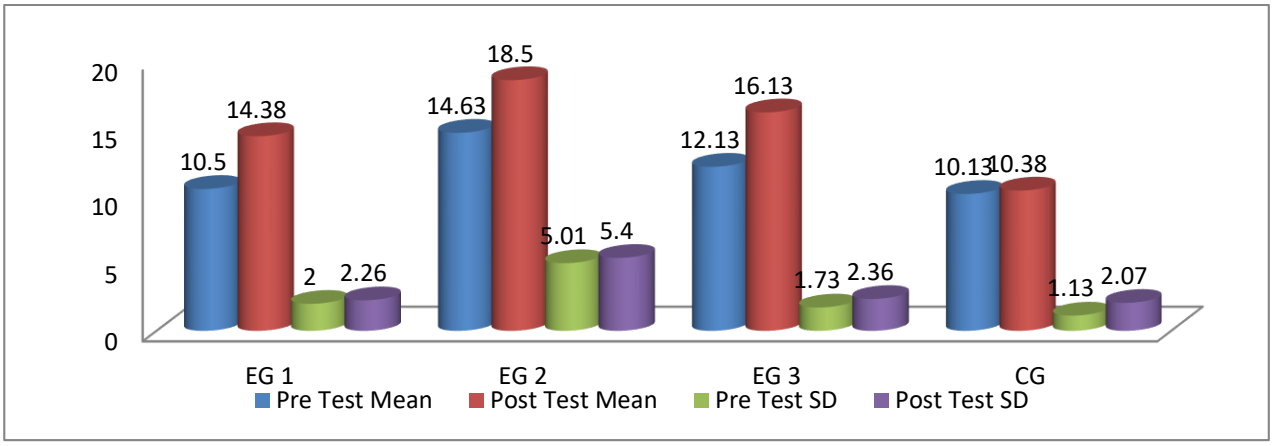

Figure - 1
Pre and Post Test Mean and SD Scores of Experimental Groups and Control Group Cardio-Respiratory Endurance

Table 7
Analysis of Covariance of the Means among Three Experimental Groups and Control Group on Muscular Strength & Endurance

Source of Variations	d.f	SS	MSS	F
Between Groups	3	70.12279307	23.37426436	**11.96548932***
Within Groups	27	52.7437801	1.953473337	

*Significant at 0.05 Level. Tab F.05 (3,27) = 2.95

Table 7 is showing that the calculated 'F' value 11.96548932 is greater than the tabulated 'F' value 2.95, so it can be concluded that there is a significant difference among all the three experimental groups and control group as per as the muscular strength and endurance is concerned at 0.05 Level of significance.

To find out the best training protocol for the improvement of muscular strength and endurance pairwise comparisons among adjusted means has been done through Least Significance Differences (LSD) test.

Table 8

Pair wise Mean Comparison (LSD) among Three Experimental Groups and Control Group on Muscular Strength & Endurance

Adjusted Means of Different Groups				MD	CD (0.05 Level)
EG -1	EG - 2	EG - 3	CG		
15.78130016	15.58928571			0.192014	
15.78130016		15.83065811		0.04936	
15.78130016			12.17375602	3.607544*	**1.432608783**
	15.58928571	15.83065811		0.24137	
	15.58928571		12.17375602	3.41553*	
		15.83065811	12.17375602	3.656902*	

*Significant at 0.05 Level.

The result of LSD test visible at table 8 shows that there is no significant difference among the walking protocol of EG – 1, EG – 2 and EG – 3 as the mean difference values of these three groups are lesser than the critical difference value at 0.05 level of significance. Although all the Experimental Groups are found to be significantly different and superior than the Control Group as the mean difference values of EG -1 and CG i.e. 3.607544, EG – 2 and CG i.e. 3.41553, EG – 3 and CG i.e. 3.656902 are greater than the critical difference value i.e. 1.432608783.

So it can be concluded that for the improvement of muscular strength and endurance all the three walking protocols are effective. Out of these walking protocols the protocol of EG – 3 is best followed by EG – 1 and EG – 2.

The difference between pre and post test scores has been presented in Figure 2.

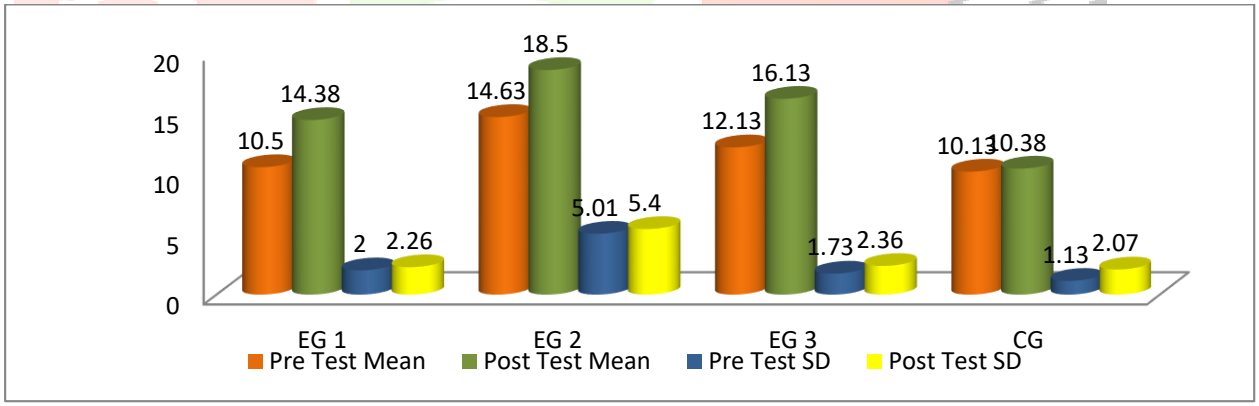

Figure - 2

Pre and Post Test Mean and SD Scores of Experimental Groups and Control Group Muscular Strength & Endurance

Table 9
Analysis of Covariance of the Means among Three Experimental Groups and Control Group on Body Fat Percentage

Source of Variations	d.f	SS	MSS	F
Between Groups	3	160.1976708	53.39922361	**166.2516124***
Within Groups	27	8.672271006	0.321195222	

*Significant at 0.05 Level. Tab F.05 (3,27) = 2.95

Table 9 is showing that the calculated 'F' value 166.2516124 is greater than the tabulated 'F' value 2.95, so it can be concluded that there is a significant difference among all the three experimental groups and control group as per as the body fat percentage is concerned at 0.05 Level of significance.

To find out the best training protocol for the improvement of body fat percentage pairwise comparisons among adjusted means has been done through Least Significance Differences (LSD) test.

Table 10
Pair wise Mean Comparison (LSD) among Three Experimental Groups and Control Group on Body Fat Percentage

Adjusted Means of Different Groups				MD	CD (0.05 Level)
EG -1	**EG - 2**	**EG - 3**	**CG**		
24.80927255	24.09362258			0.71565*	**0.5809094**
24.80927255		23.46192548		1.347347*	
24.80927255			29.22017939	4.41091*	
	24.09362258	23.46192548		0.631697*	
	24.09362258		29.22017939	5.12656*	
		23.46192548	29.22017939	5.75825*	

*Significant at 0.05 Level.

The result of LSD test visible at table 10 shows that there is significant difference among all the three walking protocols as the mean difference values of these three groups are greater than the critical difference value at 0.05 level of significance. The walking protocol of EG – 3 is found to be significantly superior than other two protocols as well as of control group. The walking protocol of EG – 2 is found to be significantly superior than EG – 1 and control group.

So it can be concluded that for the improvement of body fat percentage all the three walking protocols are effective. Out of these walking protocols the protocol of EG – 3 is significantly better than EG – 2 and EG – 1.

The difference between pre and post test scores has been presented in Figure 3.

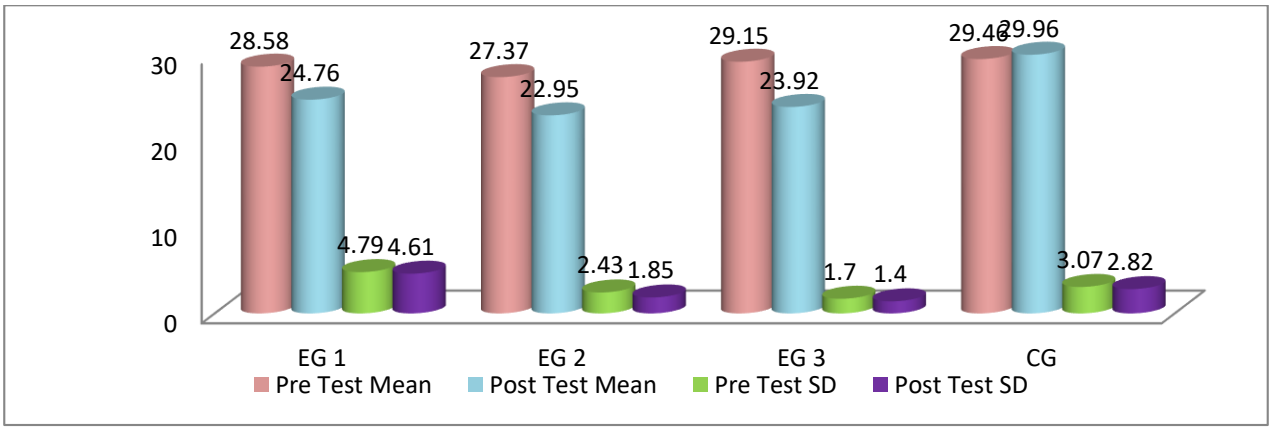

Figure - 3
Pre and Post Test Mean and SD Scores of Experimental Groups and Control Group Body Fat Percentage

Discussion and Conclusion:

The result of statistical analysis has done through ANCOVA have revealed the fact that all the three walking protocols and control group are significantly different than each other. It has also been found that all the three walking protocols are effective and significantly superior than the control group for the improvement of selected health related physical fitness components i.e. cardio-respiratory endurance, muscular strength and endurance and body fat percentage.

The result of LSD test has revealed the fact that all the walking protocols are equally effective for the development of cardio-respiratory endurance and muscular strength and endurance as no significant difference found among them. But on the basis of pre and post-test mean score walking protocol III is slightly better than other two walking protocol. In case of body fat percentage the walking protocol III done by EG – 3 was the best followed by EG – 2 and EG – 1.

So it is clear that all the three walking protocol are effective for the improvement of health related physical fitness, but walking protocol III is the best. The present researchers would like to attribute some reasons behind such kind of result.

Any training protocol continuous at least more than 30minutes/day improves the aerobic fitness (Smutok et al., 1980), which may be the reason behind the findings of the present study that all the three walking training protocols did not significantly differ from each other as per as the improvement of cardio-respiratory endurance is concerned. The findings of the present study is in consonant with the findings of the research conducted by Karstoft et al. (2013) where they found significant improvement in aerobic fitness by 8 weeks of continuous training programme. Though the findings of the present study does not support by the research conducted by Rodriguez-Hernandez & Wadsworth (2019) where they did not get any significant improvement in aerobic fitness after 11 weeks of continuous training.

From the above discussion it is clear that continuous walking protocols will improve the maximal oxygen consumption ability of the individuals so the oxygen supply to the muscle also improves. Furthermore the continuous walking can be act as resistance exercise also for the middle aged and older adults as in every steps of walking the individual is overcoming the gravitational force so the muscle hypertrophy also takes place (Sipila & Suominen, 1995; Cadore et al., 2014), also reduce the abdominal fat (Hong et al.,2014). This may be the reason that the muscular strength and endurance has been improved due to the walking protocols in this present study.

As per as body fat percentage is concerned the pre and post test result of all the three walking protocols are showing significant improvement in body fat percentage. This may be due to the fluctuations in walking intensity in all the walking protocols throughout the training period. Among all the walking protocol III found to be the best in the improvement and control of body fat percentage, may be because of the gradual increase of intensity of walking with fixed distance covered per day after every four weeks of interventions. The above findings have been supported by the findings of previous studies conducted by Murphy et al. (2007) and Karstoft et al. (2013). Another reason of lower body fat percentage may be due to continuous nature of the walking protocols (Thompson et al., 2004; Steeves et al., 2012).

So at the end it can be concluded that any kind of walking protocols with different intensity and volume, if done continuously will improve the overall health related physical fitness of middle aged people. Walking on a regular basis will improve overall health of the middle aged and older adult people. So moderate level of walking interventions can be considered as one of the best exercise for middle aged people.

The present researchers have found that all the three walking protocols with different intensity and volume are equally effective for the improvement of health related physical fitness. Among all the three walking protocols Walking protocol III found to be the best because of its gradual increase of intensity of speed with fixed distance covered in lesser duration after every four weeks of training.

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