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Effect of Brisk Walking on MDA and Blood Thiol levels in Healthy Volunteers

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ABSTRACT

Brisk walking is a physical exercise where a person walks quickly. This form of aerobic activity uplifts mood, make physically fit, and improve the quality of life. A study was designed to assess the effect of brisk walking on plasma MDA levels and blood thiol levels in healthy volunteers (n=100) and was compared with a group of normal healthy controls (n=100). The experimental group was further subdivided into two groups, i.e. as group A (in the age group of 20-35 years) and group B (age 36-50 years) with equal participants in each group. Blood samples were taken before starting the brisk walking (baseline) and after 40 and 90 days. Plasma malonyldialdehyde (MDA) level was found to be significantly reduced ($p < 0.001$) and blood thiol level was raised significantly ($p < 0.001$) after 40 days. Similarly, the changes in the both parameters were highly significant even after 90 days. Reduction in oxidative stress suggests that aerobic exercises are beneficial for maintaining good healthy.

Keywords: *MDA, Blood Thiol, Brisk walking, Lipid Peroxidation, Oxidative Stress*

INTRODUCTION

Of all the ways to get and stay fit, walking is the easiest, safest and cheapest. It can also be a lot of fun, with attainable goals. The popularity of walking as a fitness activity has grown by leaps and bounds.

Physical inactivity is the fourth leading risk factor for global mortality (behind high blood pressure, tobacco use and high blood glucose), and is a key risk factor for cardiovascular diseases (CVD)[1] being physically inactive increases a person's risk of having a heart attack or stroke.[2] A sedentary lifestyle is often associated with over-eating, which is another major contributor to diseases.

Man has tried to prevent the ill effects of lack of physical activity through several types of exercise programmes. Regular physical exercise is likely to slow the aging process, help prevent several degenerative and metabolic disorders and thereby make life healthier and longer. The exercise should involve large muscle groups, be rhythmic, and it should be possible to continue for long periods of time. Examples of such exercise are brisk walking, jogging, cycling, swimming, dancing and yogic postures (*asanas*). Recent studies indicate that fairly mild regular exercise is quite adequate for staying healthy. Compared to sedentary individuals, those who take regularly (more than 5 days a week) a brisk walk for 30 minutes a day (or any other equivalent exercise) are much healthier.[3]

MATERIALS AND METHODS

This study was conducted in 200 healthy male volunteers, in the age group of 20 to 50 years, in Department of Biochemistry, Maharaja Agrasen Medical College (M.A.M.C), Agroha, Hisar. Two hundred healthy male volunteers were divided into two groups as given below.

Group-I –which included 100 volunteers as control subjects who led their normal life without doing any yoga, meditation or exercise (n=100).

Group-II- included 100 volunteers who performed brisk walk for 45 minutes a day (which included 10 minutes warm-up, 25 minutes continuous brisk walking, and 10 min cool down).

Each group was further sub-divided into two categories, according to their age

Sub- group "A" - 50 volunteers having age in the rangeof 20 to 35 years.

Sub- group "B" - 50 volunteers having age in the range of 36 to 50 years.

For comparison, the subjects of the two age groups were put together in group C, which included all the 100 volunteers in the range of 20 to 50 years of age.

The project was reviewed and approved by the Institutional Ethics Committee. All subjects were explained about the study undertaken and informed written consent was obtained. These subjects were given a questionnaire and personal data form, which they were required to fill up with certain details like their dietary habits, extent of physical activity and family history. Subjects were asked to avoid food, tea, coffee, nicotine at least two hour prior to testing. The whole procedure was explained in detail to each subject in order to alley any fear or apprehension. The basic parameters like age, weight and height were measured and recorded in specific proforma.

Exclusion Criteria

Subjects having previous experience of yoga or sports training and suffering from any acute or chronic disease, chronic smoker, chronic alcoholics and subjects taking any vitamin or anabolic supplement were excluded.

Biochemical Parameters Studied Firstly, a baseline fasting venous blood sample (approx. 7 ml) was collected from all subjects before starting the brisk walking under the study. After starting the brisk walking, two more samples were collected after 40 days and 90 days. The volunteers were assessed for MDA and blood thiol levels

Malonyldialdehyde (MDA)- was estimated by Buege's method. In this method, the product of lipid peroxidation i.e. MDA reacts with thiobarbituric acid (TBA) to give a red chromogen, the absorbance of which is read at 535 nm (Kumar *et al.*, 1995).[4]

Total Thiols- was estimated by Ellman's method, in this method, 5-5 dithiobis-2-nitrobenzoic acid reacts with total sulphydryl groups to form a chromogen whose extinction is measured at 420 nm (Ellman, 1959).[5]

Statistical Analysis

The data was recorded; mean and standard deviation were calculated for each group. Results were statistically analyzed by Students' t- test. Paired t test was used for inter group comparisons. Analysis of variance was done to see if the group differs in any of the parameters. The interpretation of P values was as follows: P>0.05 - not significant, P<0.05 - Significant <0.01 - Highly significant, P<.001 - Very highly significant.

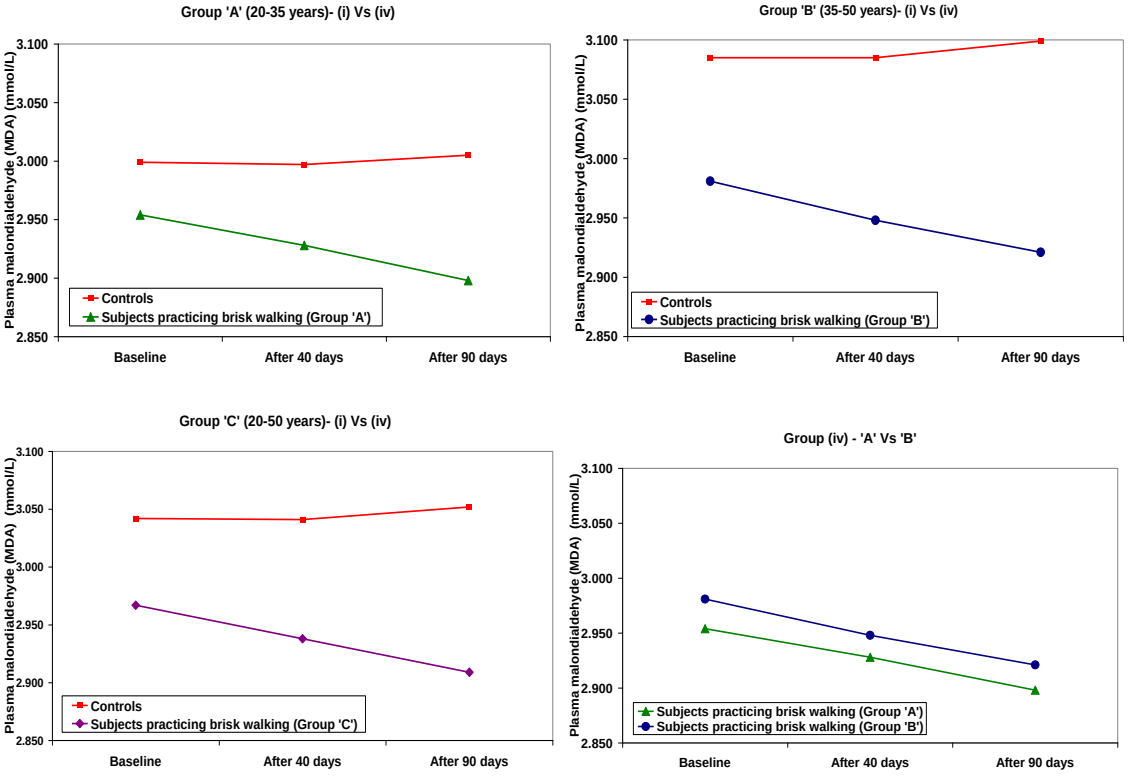
RESULTS

Data is depicted in Table 1 and Table 2. Both parameters were comparable in control subjects and subjects practicing brisk walking of each age group.

Table 1: Plasma malondialdehyde (MDA) concentration (mmol/L) in controls and subjects practicing brisk walking (values are mean ± S.D)

Groups	Control subjects			Subjects practicing brisk walking		
	Baseline	After 40 days	After 90 days	Baseline	After 40 days	After 90 days
A (20-35 years) n=50	2.999 ± 0.115	2.997 ± 0.128	3.005 ± 0.131	2.954 ± 0.096	2.928 ± 0.106*	2.898 ± 0.111*
B (36-50 years) n=50	3.085 ± 0.112	3.085 ± 0.127	3.099 ± 0.133	2.981 ± 0.103	2.948 ± 0.098*	2.921 ± 0.105*
C (20-50 years) n= 100	3.042 ± 0.121	3.041 ± 0.135	3.052 ± 0.140	2.967 ± 0.100	2.938 ± 0.102*	2.909 ± 0.108*

***p<0.001 when compared with the baseline value.**



Group (i): Control subjects **Group (ii): Subjects undergoing brisk walking**
Sub-group (A): 20-35 years **Sub-group (B): 36-50 years** **Sub-group (C): 20-50 years**
Fig. 1: Alterations in mean plasma malondialdehyde (MDA) concentration (mmol/L) insubjects undergoing brisk walking

Table 2: Total blood thiols concentration (mmol/L) in controls and subjects practicing brisk walking (values are mean ± S.D)

Groups	Control subjects			Subjects practicing brisk walking		
	Baseline	After 40 days	After 90 days	Baseline	After 40 days	After 90 days
A (20-35 years) n=50	3.989 ± 0.166	3.990 ± 0.165	3.986 ± 0.176	4.040 ± 0.207	4.064 ± 0.211*	4.080 ± 0.211*
B (36-50 years) n=50	4.001 ± 0.177	3.999 ± 0.178	4.006 ± 0.182	4.009 ± 0.202	4.044 ± 0.202*	4.057 ± 0.204*
C (20-50 years) n= 100	3.995 ± 0.171	3.995 ± 0.171	3.996 ± 0.178	4.024± 0.205	4.054 ± 0.206*	4.069 ± 0.206*

***p<0.001 when compared with the baseline value**

Subjects undergoing brisk walking

In present study the changes in the mean baseline plasma MDA concentrations in control subjects in age Group A (20-35 years) and Group B (36-50 years) after the follow-up period of 90 days was not statistically significant

In subjects practicing brisk walking, age Group A (20-35 years) and age Group B (36-50 years) the mean baseline plasma MDA concentration was decreased significantly on day 40 as well as on day 90 of practicing brisk walking.

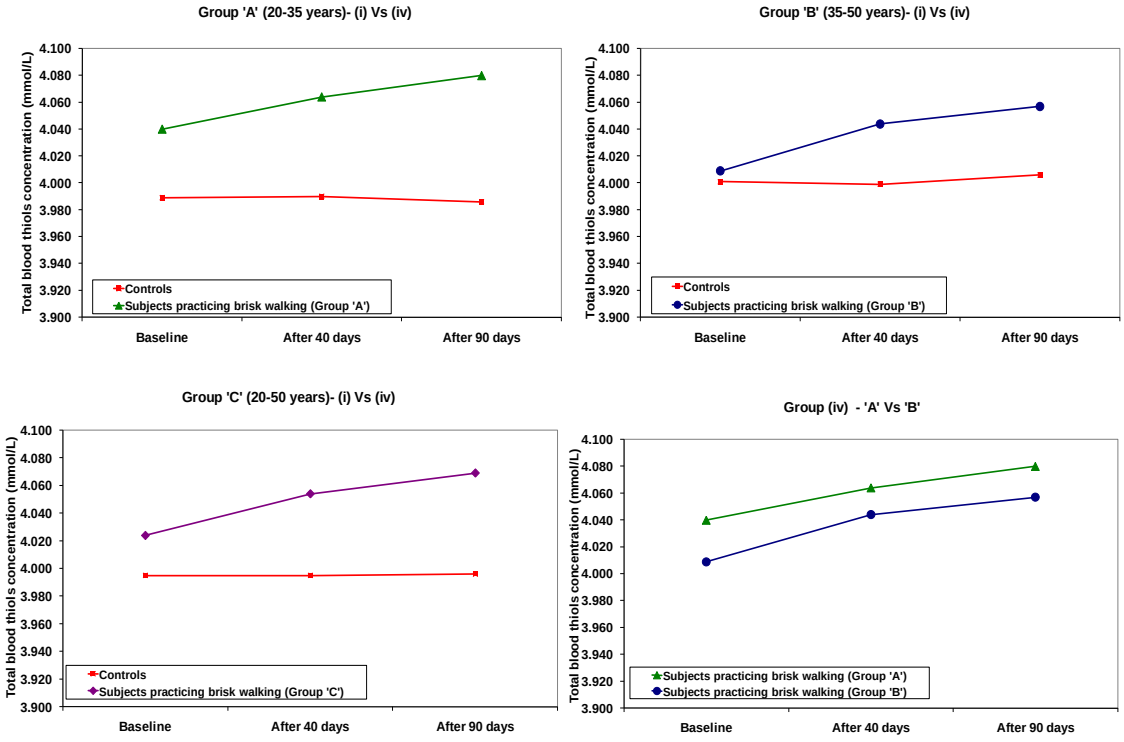
The change in the mean baseline MDA concentration in control subjects of age Group C (20-50 years) after the follow-up period of 90 days was not statistically significant. In all the subjects practicing brisk walking, age Group C (20-50 years) the mean baseline MDA concentration was significantly decreased on day 40 and on day 90 of practicing brisk walking. (Table 1 & Fig. 1).

The change in the mean total blood thiols concentration in control subjects of age Group A (20-35 years) after the follow-up

period of 90 days was not statistically significant.

In subjects practicing brisk walking, age Group A (20-35years) the mean baseline total blood thiols concentration was increased on day 40 and on day 90.The change in the mean baseline total blood thiols concentration in control subjects of age Group B (36-50 years) after the follow-up period of 90 days was not statistically significant. In subjects practicing brisk walking, age Group B (36-50 years) the mean baseline total blood thiols concentration was significantly increased to on day 40 and on day 90.

The change in the mean baseline total blood thiols concentration in all the control subjects of age Group C (20-50 years) after the follow-up period of 90 days was not statistically significant. In all the subjects practicing brisk walking, age Group C (20-50 years) the mean baseline total blood thiols concentration was significantly increased on day 40 and on day 90. (Table 2 & Fig. 2).



Group (i): Control subjects **Group (iv): Subjects undergoing brisk walking**
Sub-group (A): 20-35 years **Sub-group (B): 36-50 years** **Sub-group (C): 20-50 years**
Fig. 2: Alterations in mean total blood thiols concentration (mmol/L) in

DISCUSSION

Subjects practicing brisk walking also showed a significant reduction in serum MDA concentration and a concomitant rise in total blood thiols level up to 90 days when compared to the control group. Differences were nearly same in the two age groups.

Physical activity is an important behavioural cofactor; people who describe themselves as active have lower levels of inflammatory biomarkers than their sedentary counterparts.[6] when physical or cardiorespiratory fitness is assessed rigorously and objectively by maximal exercise testing, fitness is inversely associated with inflammation, even after adjusting for confounds including age, smoking, medications, and visceral fat.[7-10]

Wang *et al* studied the effect of brisk walking on multiorgan insulin sensitivity in older women. They observed that basal rate

of glucose appearance into plasma was not different after rest and after exercise.[11] Respiratory rate, vital capacity, blood sugar, cholesterol, anxiety and stress have also been reported to be changed due to walking in a favourable direction.[12] Hardman and Hudson examined the effectiveness of brisk walking, as a means of improving endurance fitness, and reported that HDL-C concentration increases with walking, in sedentary women.[13] Murphy et al also studied the effect of different patterns of brisk walking on plasma triacylglycerol concentrations in sedentary adults and reported that postprandial plasma triacylglycerol concentrations were reduced during walking trials than during the control trial.[14] They concluded that thirty minutes of brisk walking, undertaken in one session or accumulated throughout a day, reduces postprandial plasma triacylglycerol concentrations and increases fat oxidation. They further studied the effect of different patterns of brisk walking and reported that brisk walking increases plasma concentration of HDL-C and decreases concentrations of triacylglycerol and total cholesterol. They suggested that three short bouts (10 mins) of brisk walking, accumulated throughout the day, are as effective as one continuous bout of equal total duration in reducing cardiovascular risk.[15]

There are other reports suggesting that brisk walking increases plasma homocysteine and reduces triglyceride, total cholesterol and LDL-C concentrations.[16,17] Plaisance *et al* reported that aerobic exercise reduces serum triglyceride concentrations and that the reduction in serum triglycerides after aerobic exercise is associated with an increase in skeletal muscle lipoprotein lipase activity and a decrease in hepatic triglyceride, and VLDL synthesis and secretion.[18] Akcakoyun F studied middle-aged men who were randomly assigned to exercise and reported that their serum triglyceride concentrations decreased while HDL-C increased in the exercise group compared to the control group.[19] Several studies have shown that different types of exercises lower blood glucose level in patients of type 2 diabetes. Hordern *et al* determined the effect of a four-week exercise training intervention in patients with type 2 diabetes, and reported that it resulted in improvement in blood glucose, triglycerides, BMI and cardiorespiratory fitness.[20]

Several workers have reported that anaerobic and aerobic exercises also alter oxidant and antioxidant status of the body. Hatha yoga and conventional physical training exercise have been shown to decrease lipid peroxidation, as indicated by MDA, with an increase in SOD activity as compared to the baseline levels.[21] Shi et al suggested that aerobic exercise initially generate more reactive oxygen species (ROS) whereas anaerobic exercise may induced prolonged ROS generation.[22] Abd -Elkader *et al* reported that increase in the intensity of aerobic endurance of physical effort to achieve higher competitions performance elevate oxidative stress at variable rates.[23] Michaelides *et al* have shown that shorter exercise duration is associated with favourable antioxidant and vascular effects whereas longer exercise blunted these beneficial effects and is accompanied by its adverse effects.[24] Brisk walking, as shown in the present study, resulted in a decrease in MDA and increase total blood thiol concentration suggesting that even a moderate type of exercise affect oxidative stress and antioxidant status.

CONCLUSION

The findings conclude that brisk walking had enhanced the antioxidant defense mechanism in healthy individual by reducing oxidative stress.

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