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The Influence of concurrent exercise Modality Order on postexercise hypotension in prehypertensive men

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Abstract

Background*: Treating prehypertension with physical activity is an ideal solution, especially in developing countries, due to the low cost and no side effects.* ***Problem Statement:*** *More than half of Egyptian adults with prehypertension are unaware of their condition, in addition to limited financial resources and health spending.* ***Approach****: On 30 prehypertensive men who frequent the gym aged 35 - 40 years (37.50 ±1.78 years), They were divided into two groups of equal number N = 15, group 1 used Aerobic exercise (AE) then Resistance exercise (RE) , group 2 Resistance exercise then Aerobic exercise for three months.* ***Purpose****: know of the chronic effects of concurrent exercise Modality Order on postexercise hypotension.* ***Results****: decrease SBP 11.83, DBP 3.5 mmHg with an augmentation in oxygen consuming for the AERE group, In contrast to the REAE group SBP 13.0, DBP 3.83 mmHg as muscle mass increases.* ***Conclusions****: a linear response between losing BW and lowering SBP, DBP , but the effect of losing more weight on lower SBP, DBP has not yet been investigated.* ***Recommendations****: Concurrent exercises works to prevent and treat high blood pressure, reduces the rate of atherosclerosis.*

Key Words:

Aerobic exercise , Resistance exercise , Concurrent exercises , Prehypertension , postexercise hypotension , Atherogenic Index.

Introduction:

Blood pressure treatment is a burden on the Egyptian economy because of its high prevalence as well as limited financial resources and health spending (Ibrahim, M. M. (2013) (5). Note more than half of Egyptian adults are unaware of the risk of developing hypertension (Soliman, S. S,(2020) (12).In prehypertension , no drug therapy is recommended when blood pressure is less than 160/100 mmHg , recommended exercise and lifestyle changes (Ibrahim, M. M. (2014) (6).

Following a healthy lifestyle by exercising is one of the most important treatments recommended for prehypertension (Zeigler, Z. (2016)(17).Regular exercise helps reduce blood pressure, whether it is aerobic, resistance, or concurrent exercises , A healthy lifestyle and regular physical activity are also considered a less expensive and safer option, with no negative effects associated with blood vessels (Pescatello, L. (2004)(9).

The use of concurrent exercise sessions has an functional effect on postexercise hypotension (PEH) , when acute exercise is used regardless of exercise order (Stone, W. J., (2020)(13). In this study we are looking The effect of concurrent exercise difference order on postexercise hypotension using chronic exercise.

Material & methods

Participants:

The experimental design was used on 30 prehypertensive systolic blood pressure (SBP) >120-<140 mmHg and/or diastolic blood pressure (DBP) >80-<90 mmHg men group 1 (N=15) and group 2 (N=15) elderly 35 - 40 years were Intentionally, Participants were excluded from the study if they were existing smokers, Take chronic medications, Orthopedic problems that limit Physical performance , The experimental design was confirmed by the Faculty of Physical Education, Minia University and participants signed an informed consent.

Procedures:

Participants completed a total of 48 sessions Over the course of 12 weeks , Session time 70 minutes, 5 minutes warm-up, 5 minutes cool down, 60 minutes concurrent exercise (CE), group 1 used Aerobic exercise (AE) then Resistance exercise (RE) , group 2 Resistance exercise then Aerobic exercise, From 8/1/2022 to 4/3/2022.

Aerobic exercise:

The aerobic exercise was performed Jumping jacks, JOG, Lunge lower body, Heisman, Butt kicks, High knees, March Steps, Mummy Kicks, Slow Squats, suicide drills, cross jacks, treadmill, spinning exercise , 30 min at the exercise intensity corresponding to 50–60% MHR two times a week , 60–65% and 65–70% MHR Once a week , monitored through Maximal Heart Rate (MHR) Sport Tester PE 3000 (POLAR TRANSMITTER FINLANDA) (PTF), Bruce's

equation was used to estimate MHR 204 - (1.07 × age) based on Karvonen method THR = [(HRmax − HRrest) × intended fraction) + HRrest] , the intended fraction expressed as percentage % (Robergs, R. A., (2002)(10) .

Resistance exercise:

The 1RM workload was determined for the consisted of 3 sets of 8-12 repetitions on biceps curl, Chest Press, Seated Shoulder Press, Triceps Press down, Wrist Curl - Extension and flexion, Bent-over Row, Seated Lat Pulldown, Back Squat, , Leg Press, leg extension , leg curl and Calf Raises , 30 min at the exercise intensity corresponding to 60-65% 1RM two times a week, 65–70% and 70–75% 1RM Once a week, Brzycki's equation was used to estimate One Repetition Maximum (1RM) 1RM= [W × (36 / 37-R)], (W) Lifted weight (R) number of repetitions, using Technogym equipment (Brzycki, M. (1989) (1).

Test protocol :

Calculation of $VO2_{max}$: The Tecumseh equation was used to predict submaximal oxygen consumption by stepping on a 20 cm bench for 3 minutes at a rate of 24 steps per minute using a metronome., $Vo2_{max}(M) = 84.687 – 0.722 \times HRpost – 0.383 \times age$, where HRpost is heart rate 30 seconds after the end of the test, Heart rates were measured by (PTF) (Hughes, A. D., (2017)(4).

Blood pressure screening :

The cuff is tightly placed over the arm of the non-dominant participant, BP was measured after 20 minutes of rest before every session , All BP measurements were taken with the participant sitting on a chair with the back support and feet on the ground , after performing the session, resting BP was taken after 20 minutes of rest , during the training program as a whole, They are instructed to avoid consuming tea, coffee and similar items during the meal prior to each training session , and their BP was assessed using Pressure monitor HEM-7200 – Omron.

Body composition measure :

was assessed using (TANITA BC – 545N JAPAN) based on advanced Bioelectrical Impedance Analysis, Weight (WT), Body fat% (BF), Muscle Mass (MS), Visceral Fat (VF) , Measure the Height (HT) to the nearest 0.5 cm using the (Restameter), Atherogenic Index (AI) using an equation [Total cholesterol – HDL_C / HDL_C], where HDL_C is high density lipoprotein cholesterol (Nakamura, E., (1989)(8).

Statistical analysis :

All statistical transactions were by using SPSS software version 22 , Descriptive statistics was used mean ± standard deviation (SD), Non - parametric tests Wilcoxon test, A normal allocation was assessed with Kolmogorov - Smirnov test, All Sig p values were calculated assuming two-tailed hypothesis; $p < 0.05$ was considered statistically significant.

Results

Table (1)
Moderation in descriptive variables (N = 30)

Variables	Mean	SD	Kolmogorov - Smirnov Test		
			Statistic	df	Sig. p.value
Age (y)	37.50	1.78	0.133	12	0.200
HT (CM)	171.58	2.19	0.107	12	0.200
WT (kg)	91.00	3.19	0.160	12	0.200
BF (%)	32.41	1.74	0.178	12	0.200
MS (Kg)	29.57	1.02	0.160	12	0.200
VS (Rating)	11.91	1.37	0.164	12	0.200
AI (Rating)	3.37	0.24	0.195	12	0.200
SBP (mmHg)	131.33	1.66	0.204	12	0.178
DBP (mmHg)	81.75	1.48	0.193	12	0.200
VO2max (ml min−1 kg−1)	23.21	3.04	0.133	12	0.200

HT Height, WT Weight, BF Body fat, MS Muscle Mass, VS Visceral Fat, AI Atherogenic Index, SBP systolic blood pressure, DBP diastolic blood pressure, $VO2_{max}$ Maximal Oxygen Consumption, SD standard deviation.

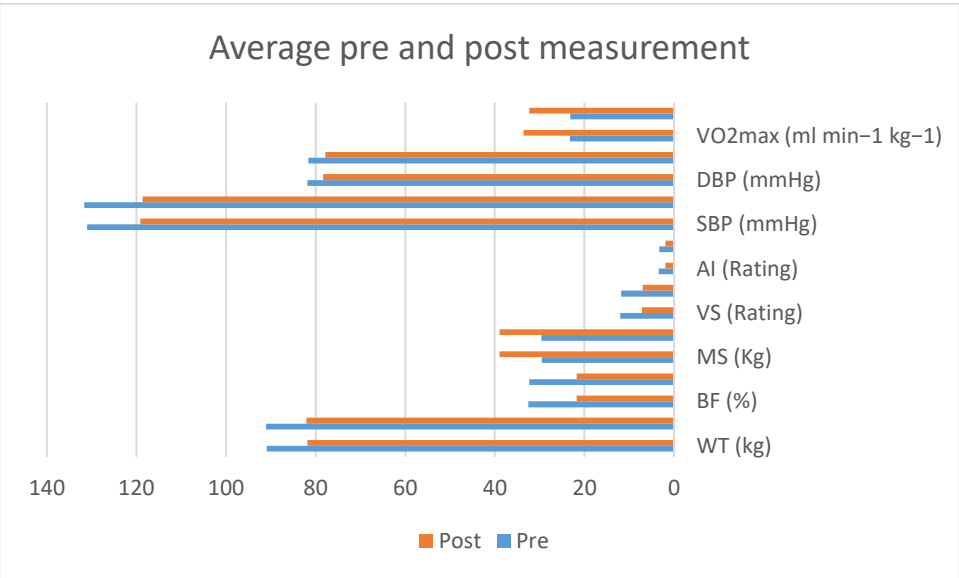
As illustrated in Table 1 It is evident from the results of the statistical analysis of the Kolmogorov - Smirnov test that the all Variables of p.value > 0.5% significant level, indicating that the sample data was withdrawn from a population whose data follow the normal distribution.

Table (2)
The disparity between the pre and post measurement in the study variables (N1=N2=30)

Variables		Pre test		Post test		Z	Sig. p.value
		Mean	SD	Mean	SD		
WT (kg)	group 1	90.91	3.47	81.83	2.33	2.226	0.026
	group 2	91.08	3.12	82.08	2.08	2.201	0.028
BF (%)	group 1	32.50	1.87	21.75	1.17	2.214	0.027
	group 2	32.33	1.77	21.75	1.12	2.232	0.026
MS (Kg)	group 1	29.56	1.04	38.93	0.77	2.201	0.028
	group 2	29.58	1.11	38.98	0.70	2.226	0.026
VS (Rating)	group 1	12.00	1.41	7.16	1.16	2.333	0.020
	group 2	11.83	1.47	7.00	1.26	2.333	0.020
AI (Rating)	group 1	3.41	0.26	1.96	0.16	2.214	0.027
	group 2	3.33	0.24	1.97	0.14	2.201	0.028
SBP (mmHg)	group 1	131.00	1.78	119.17	0.98	2.232	0.026
	group 2	131.67	1.63	118.67	1.21	2.264	0.024
DBP (mmHg)	group 1	81.83	1.47	78.33	1.03	2.264	0.024
	group 2	81.66	1.63	77.83	1.16	2.232	0.026
VO2max (ml min−1 kg−1)	group 1	23.27	3.39	33.62	3.61	2.207	0.027
	group 2	23.15	2.97	32.29	3.68	2.207	0.027

As illustrated in Table 2 There are statistical significant differences between the pre and post measurement, as all the variables amounted to p.value < 0.5% significance level**.**

Figure 1: Average pre and post measurement in the study variables



Discussion

Our results indicate that there is a gradual decrease in weight for the two experimental groups, accompanied by a decrease in SBP, in (group 1) with a loss of 1 kg of body weight, the SBP decreased by 1.30, DBP 0.39 mmHg and (group 2) SBP 1.44, DBP 0.42 mmHg, Weight loss has been shown to reduce high blood pressure in overweight patients (Winnicki, M., (2006)(14) . This study indicates a linear response between losing BW and lowering SBP, DBP , but the effect of losing more weight on lower SBP, DBP has not hereafter been scrutinized, because SBP, DBP decrease may not be proportionate to BW loss, there may be a BW

loss range behind which there is no clear-cut interest in SBP, DBP reduction .

awareness to reducing weight gain at a certain duration of life, such as in young puberty, It may have good long-term effects in preventing high blood pressure or its return with aging (HAVLIK, R. J., (1983)(3).

The results show significant enhancements on MS for both group ($p < 0.05$) However, the largest increase was in favor of (group 2) with a change rate of 31.78% and (group 1) 31.69%.

There are clear indicators between percentage of body fat, visceral fat and muscle mass were significantly associated with higher degree of probability for prehypertension, Previous studies have shown that increased body fat, visceral fat and reduced muscle mass are related to elevated blood pressure (Ye, S., Zhu, C., (2018)(15). The use of concurrent exercise (CE) helped reduce BF and VS, Also, increase in MS in the body , which affected a decrease in SBP, DBP.

The prevalence of pre-hypertension was significantly associated with increased systolic and diastolic pressure and increased fat and body composition ratios. Therefore, important interventions that include regular physical activity are recommended to reduce obesity and cardiovascular complications (Kemp, C., Pienaar, (2011)(7).

The concurrent exercise had a significant effect in improving the atherogenic index and the change rate for (group 1) was 54.52% and (group 2) 40.84%, and it has been proven that regular physical activity helps reduce obesity and reduces the risk of developing cardiovascular diseases ,high blood pressure and lipid profile (Shen, S., Lu, (2017)(11).

The results show significant enhancements on VO2max for both group ($p < 0.05$) The most evident increase in vo2max was for (group 1) a change rate of 44.47%, (group 2) 39.48%, In this study, it was noted that increased $VO2_{max}$ was associated with lower blood pressure and lower incidence of heart and circulatory diseases.

The results of one study indicate that regular physical activity and cardiovascular fitness predicted by VO2max are associated with improvements in healthy quality of life and reduced cardiovascular risk factors (Zafra, M. M., (2018)(16).

The postexercise hypotension was greater after the high-intensity bout compared to the less intense bout , post-exercise hypotension are, It is related to the adaptations that occur in the long term as a result of regular physical activity and to what extent acute training reflects a drop in blood pressure as a result of the performance of a single training unit, In this study the link was made postexercise hypotension to the long-term antihypertensive adaptations related with doing physical activity.

The current study is one of the most important studies to estimate the efficiency of rating the different order of exercise when observation PEH on long term, With an rate BP decrease of SBP 13.0 DBP 3.83 mmHg, the REAE session was accountable for the better proportion of PEH while not statistically diverse from the AERE session SBP 11.83 DBP 3.5 mmHg , these data suggest that the different order of exercise did not hinder a PEH rejoinder in prehypertension men.

In agreement with the above verification a studies allude Blood pressure continued low for sundry hours following exercise that the different order of exercise did not hinder a PEH response in prehypertensive or hypertensive, these results indicate that an acute bout of concurrent exercise will tentatively product PEH, So using chronic exercise may help permanently lower blood pressure (Stone, W. J., (2020)(13), (Ferrari, R., Umpierre, (2017)(2).

Conclusions

In epilogue, the present study demonstrates that concurrent exercise product significant reductions in SBP for both group Although the different order of exercise modality, the increase in muscle mass was greater for the REAE group, the increase in $VO2_{max}$ was greater for the AERE group, In the long term PEH becomes more permanent.

Recommendations:

Concurrent exercises with a combination of resistance exercise and aerobics works to prevent and treat high blood pressure, reduces the rate of atherosclerosis, Preserving body composition by increasing muscle mass and decreasing fat mass and visceral fat, Increase the ability of muscles to consume oxygen.

Conflicts of interest:

There is no conflict of interest in applying this research **.**

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