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The Effect of Handgrip Exercises on Blood Pressure

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Aim of the study: That handgrip exercises may also be effective for assisting with blood pressure management and adjust ability of a low-intensity working.

Methods: Twenty high normal and prehypertensive individuals without pharmacological, aged between 50and 65 years, males and Females, conducted with handgrip exercises for 8 weeks. Participant's performed 4×2 minute isometric handgrip exercises with their non-dominant hand, each separated by a 3-minute rest period, 3 days a week.

Results: Blood pressure measurements were conducted at baseline and at the end of the protocol using a wrist blood pressure monitor. Eight weeks of isometric resistance training resulted in a 7-mmHg reduction of resting systolic blood pressure (SBP) (136±12 to 129±15); (P=0.04). Reductions of 4mmHg were also seen in mean arterial pressure (MAP) (100±8to96±11);(P=0.04).

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Conclusion: Handgrip exercise of maximum voluntary contraction significantly reduced SBP and MAP. Isometric handgrip (IHG) exercise training might be a simple, effective, inexpensive and non-pharmacological method in lowering blood pressure.

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I. Introduction

Evidences show that every year, worldwide9.4 million people deaths die from complications of hypertension, which has become a global public health problem.(1) Hypertension is a major risk factor that contributes to cardiovascular disease, including coronary artery disease, stroke, and heart failure.(2,3)Additionally risk factors increased the prevalence of hypertension include population growth, increased age and behavioral risk factors, such as unhealthy diet, tobacco use, consumption of alcohol, excess weight, exposure to persistent stress, high cholesterol, diabetes mellitus, and lack of physical activity. Furthermore, Strategies implemented to prevent and manage hypertension include reducing exposure to behavioral risk factors and early detection and treatment of hypertension. (4) That found a Prehypertension is characterized by systolic blood pressure of 120–139 mmHg and diastolic blood pressure of 80–89 mmHg, measured at rest.(5)High total peripheral resistance is the most commonly reported mechanism for the mildly increased blood pressure in hypertension, which is often accompanied by decreased arterial compliance.(6) Although it is unclear whether these changes occur in prehypertension.(21) Hypertension is responsible for 45%of cardiovascular deaths owing to heart disease and 51% owing to stroke worldwide.(1) Antihypertensive medications are effective at controlling blood pressure and have minimal side effects; however, only half the people with hypertension reach treatment goals.(38) Current first-line treatment for hypertension is non-pharmacological lifestyle modification including eating healthy diet, cessation of smoking, and increasing physical activity. (2,3,35) Currently, the recommended exercise program me for blood pressure management in adults is dynamic endurance aerobic exercise of at least 150-minute moderate intensity,75-minutevigorous intensity, or an equivalent combination of both each1week, as well as at least 2 days of muscle strengthening.(7)They found one important factor that may impact the effectiveness to lower blood pressure (BP) is the type of exercise performed. Analyses suggest isometric exercise may elicit BP reductions greater than those seen with dynamic aerobic and resistance exercise. (33, 34) However, isometric handgrip activity may become a new tool in the non-pharmacological treatment of high BP.(30,32) Isometric exercise involves sustained contraction against an immovable load or resistance with no or minimal change in length of the involved muscle group. Aerobic exercise performance has been shown to be inversely related to hemodynamic measurements.(38) Recent analyses suggest that isometric resistance training (IRT) may elicit blood pressure reductions greater than those seen with dynamic aerobic and resistance exercise.(2,8,9) A recent systematic review and subsequent meta-analysis confirms previous findings that IRT reduces systolic blood pressure (SBP) by almost 7mmHg, whereas diastolic blood pressure (DBP) and mean arterial pressure (MAP) were both lowered by almost 4mmHg. (2) Low-to moderate-intensity isometric handgrip exercise can be performed anywhere, requires relatively inexpensive equipment, and does not elicit the same level of cardiovascular stress as aerobic exercise.(2) Although most evidence indicates that greater handgrip

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strength is associated with lower BP. (23,24) Recent work suggests that IRT may become a new tool in the non-pharmacological treatment of high blood pressure.(10,12) males and individuals aged ≥45 years, may acquire greater blood pressure reductions from IRT(13). Randomized controlled studies of IRT, for ≥4 weeks in duration, have predominately used a 30% maximum voluntary contraction (MVC) and a sedentary control. (9) Ray and Carrasco(14) utilized a sham group, which held a handgrip dynamometer, but did not generate any force. Previous studies have utilized a low intensity during isometric leg training. (15, 16)We have found no reported studies, which have utilized an intensity <10% MVC handgrip exercise with prehypertensive and/or hypertensive participants. In addition, previous studies of 4 to 10 weeks duration have focused on people aged between 20 and 35 years or 60 and 80 years with a sedentary control. In addition isometric handgrip study with 10 participants aged 52±5 over 6 weeks have conduct. (17)

II. Methods

This study conduct on Port Said Hospital extended from April 2018 to January 2019. The participants with high normal and pre hypertensive, aged between 50 and 65 years recruited from out Hospital clinic. Participants from males and Females had a resting SBP ≥130mmHg and/or a resting DBP≥85mmHg, were receiving pharmacotherapy to treat their BP. written informed consent. Participants were excluded if they had known cardiovascular disease or multiple comorbidities, smokers, carpal tunnel, and arthritis which may have been aggravated with handgrip exercise. Participant baseline characteristics are displayed in. Participants trained 3 days per week for 8 weeks non-dominant hand. Participants then completed 4 sets of 2-minute isometric handgrip contractions separated by 3-minute rest periods.

Table 1: Entheroment

Characteristics	
Male	(n)7
Female	(n)11
Age, y	58±6
Height, cm	170±9
Weight, kg	88±16
BMI, kg/m2	30±6
(SBP), mmHg	136±12
(DBP) mmHg	77±7
(MAP)mmHg	100±8
(H R)bpm	67±9

Pre and post intervention blood pressure was established to assess resting SBP, DBP, heart rate (HR), and MAP. The wrist blood pressure monitor method to enable continuous noninvasive BP measurements. All post tests were conducted 24 hours after the final day of week 8 IRT and within 2 hours of the initial pretesting time of day. Blood pressure was measured in the participants' dominant arm Baseline and 24-hour post-IRT blood pressure measurements were conducted with the participant lying supine, with their arm relaxed by their side. Spss version was used to calculate the mean and standard deviation for the last 15, 30, 60, and the entire 120seconds of baseline and post-IRT recording.

III. Results

20 participants who completed the 2 months study of IRT, to establish the size of reduction in blood pressure, a 120-second resting baseline blood pressure recording was taken before and 24hours post-IRT Paired t test (Table 2).

Table 2

	Mean, s		P
	Pre	post	
Systolic	136±12	129±15	0.04*
Diastolic	77±7	75±9	0.21
MAP	100±8	96±11	0.04*
HR	67±9	69±11	0.37

Data are expressed as mean ± SD. Pre: assessment before the start of the IRT program of Systolic blood pressure in comparison to Post,* $P < 0.04$, and MAP. * $P < 0.04$ in comparison to Post.

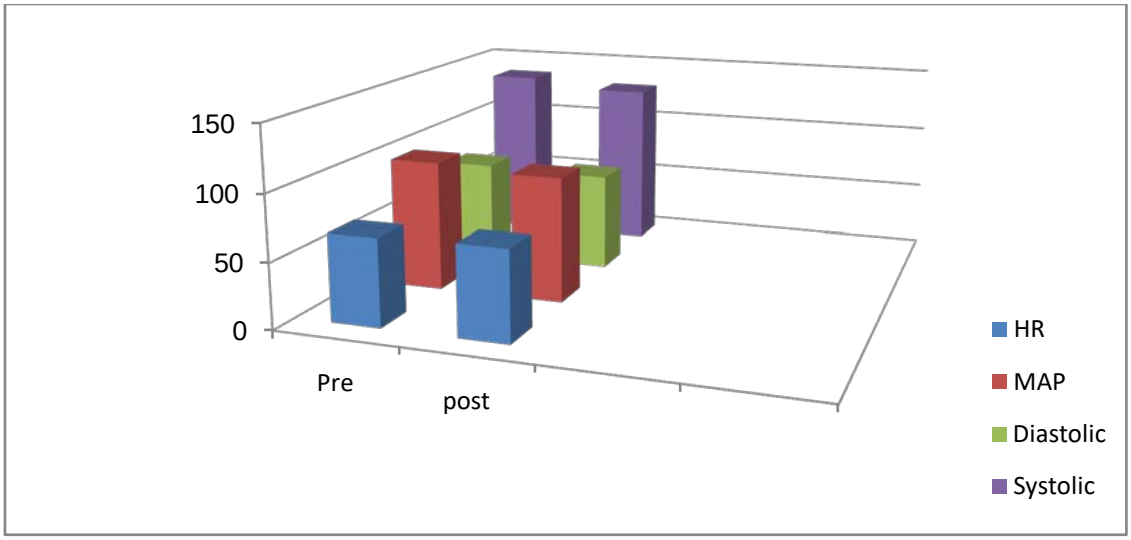

Figure 1

Table 3: Comparison of effect of Systolic sampling duration

Systolic(mmHg)	15 s	30s	60s	120s	ANOVA (F)	P
Pre	135±13	135±13	135±13	136±12	0.482	0.58
Post	129±16	128±16	129±16	129±15	0.414	0.67
P	0.07	0.06	0.06	0.04*		

Table 3 exhibits comparisons between 15, 30, and 60-second sampling, against the 120-secondSystolic blood pressure recording

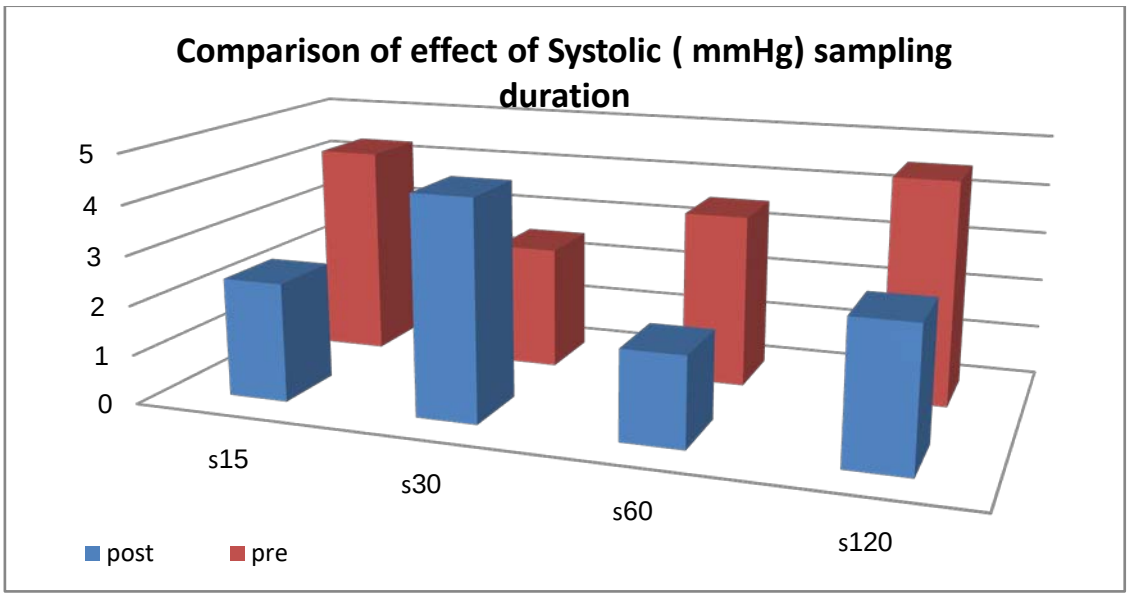

Figure 2

Table 4: Comparison of effect of Diastolic sampling duration

Diastolic(mmHg)	15 s	30s	60s	120s	ANOVA (F)	P
Pre	76±7	76±7	77±7	77±7	2.204	0.13
Post	75±9	74±9	74±9	75±9	0.120	0.86
p	0.43	0.32	0.27	0.21		

Table 4 exhibits comparisons between 15, 30, and 60-second sampling, against the 120-second Diastolic blood pressure recording

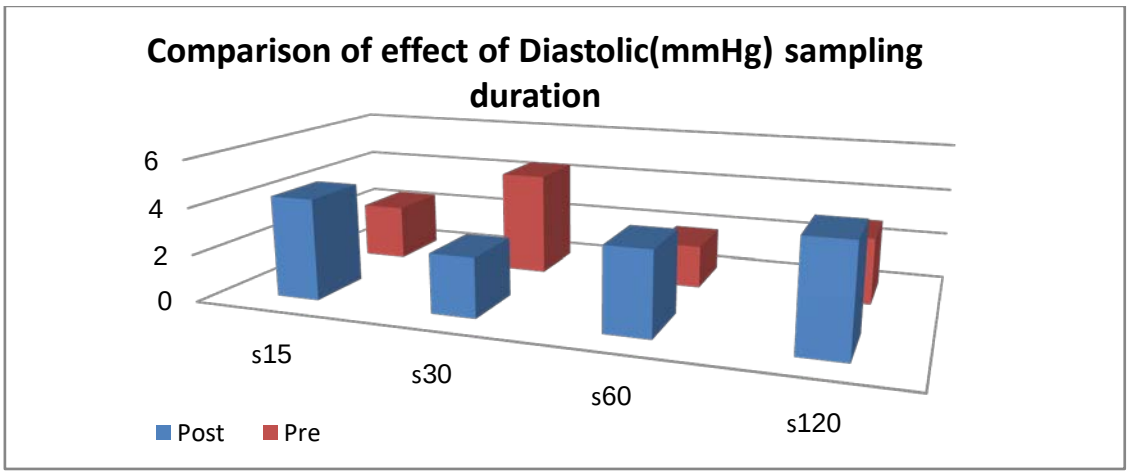

Figure 3

Table 5: Comparison of effect of MAP sampling duration

MAP(mmHg)	15 s	30s	60s	120s	ANOVA (F)	P
Pre	99±9	99±9	99±9	100±8	1.466	0.25
Post	95±11	95±11	95±11	96±11	0.143	0.87
P	0.12	0.07	0.05*	0.04*		

Table 5 exhibits comparisons between 15, 30, and 60-second sampling, against the 120-secondMAP recording

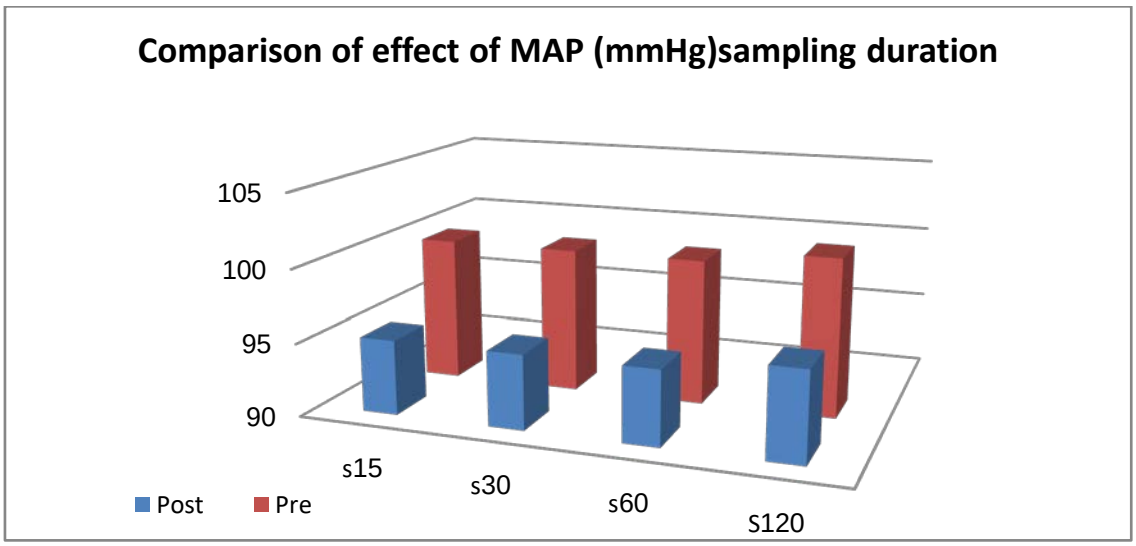

Figure 4

Table 6: Comparison of effect of HR sampling duration

HR(bpm)	15 s	30s	60s	120s	ANOVA (F)	P
Pre	67±9	67±9	67±9	67±9	0.247	0. 71
Post	69±12	69±11	69±11	69±11	0.814	0. 42
P	0.33	0.34	0. 43	0.37		

Table 6 exhibits comparisons between 15, 30, and 60-second sampling, against the 120-secondHR recording

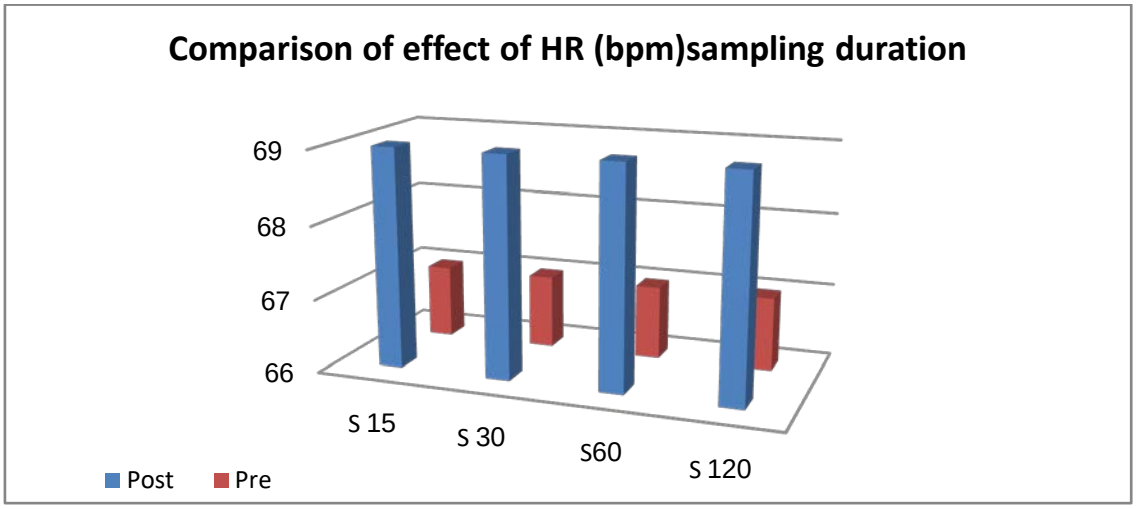

Figure 5

Wrist blood pressure monitor measurements were Paired t test analysis of blood pressure, MAP, and HR. Two months of isometric handgrip training resulted in a significant reductions were 7-mmHg reduction in baseline versus post intervention SBP of (p=0.04*). Paired t test however, there were no significant reductions in DBP. Significant reductions were observed in MAP from baseline to post intervention of 4mmHg (p=0.04*) in (Table 5). Analysis indicated an unchanged HR (P=0.37). ANOVA measures for 15, 30, 60, and 120seconds of pre- and post-resting SBP, DBP, MAP, and HR showed that the only data with statistically significant variation across the 4 measurements, the SBP and MAP as seen in Table 2 were significant with * P < 0.04, Based on this analysis, it was determined that the 120-second data were more stronger.

IV. Discussion

The main finding of this study was that significant reductions in SBP and MAP in individuals conducting IRT for 8 weeks. The reduction in SBP was clinically significant 7mmHg and MAP 4 mmHg. The 5reduction in SBP is considered clinically meaningful (>3mmHg). (24, 25) Evidence demonstrated, the effect of isometric handgrip exercise on reducing BP in normotensive and hypertensive populations.(22) In addition, the positive associations between handgrip strength and BP explained the mechanism that Peripheral vascular resistance increases with chronological age due to reduced sympatholytic, which results in an elevated sympathetic tone. (19, 18) And vascular resistance increased with morphological changes in the arteriolar network. (11) Furthermore, BP is associated with the age-associated loss of lean mass. (37, 36) The results seen in this study reflect those seen in previous IRT studies, which also demonstrated significant reductions in SBP over an 8-week period. (2,35,8,13) When baseline blood pressure was added as a covariate, secondary analysis showed that SBP, DBP, MAP, and HR were all significantly reduced. Although it is unclear whether the size of these reductions is clinically meaningful, it found that the magnitude of blood pressure reductions following IRT is directly related to pre-training blood pressure levels (26)Which could perhaps be explained by regression to the mean. Mean DBPs at baseline in our study were within the normal range, having population baseline mean <85mmH. Taking into account the limited potential for further reductions in DBP, we did not expect to see much of a reduction in DBP after IRT intervention in either group. No significant reduction in DBP. Some small studies have failed to show DB Preductions; Howden et al(27) who had 8 participants conducting 5 weeks of IRT and Taylor et al.(28) with 9 participants after 10weeks of IRT, saw no statistical reductions in DBP with baseline<85mmHg. In contrast, both single studies (29) and pooled analyses from several studies (2,8,10) have shown significant reductions in DBP after IRT. Although baseline DBP may predict significant responses to IRT, again it is unclear whether the size of these reductions is clinically meaningful. The significant reduction in MAP lowered from 100 to 96mmHg, which is clinically meaningful. Reductions in MAP were also seen by Carlsonet al (2) and Millar et al.(35)No changes in HR, The absence of change in resting HR indicates that IRT has a minimal effect on the parasympathetic nervous system. Other analyses have failed to show a reduction in HR with IRT when conducting an isometric handgrip protocol. (29, 31)The results of this study confirmed the overall that IRT lowers SBP, DBP and MAP. The magnitude of effect may belarger in hypertensive males aged ≥45 years, using unilateral arm IRT for 48 weeks. (39)

V. Conclusion

Reduction in SBP after 8 weeks of IRT, indicating that IRT may be an alternative exercise for people who are unable to reach the current recommendations of 2.5 hours of weekly aerobic exercise, to aid in their blood pressure management. IHG exercise training might be a simple, effective, inexpensive and non-pharmacological method in lowering blood pressure.

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