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A New Isometric Exercise Training Induced Reductions of Resting Blood Pressure in Hypertensive Patients- An Exploratory Study

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ABSTRACT *--Exercise training programs represent a broadly recommended element in the prevention and treatment to reduce resting blood pressure (BP) may have significant implications for management of hypertension. A developing body of evaluationindicates that isometric exercise training (IET), albeit conducted predominantly in a lab setting, is effective at decreasing resting BP. The main goal of this research study was to explore whether 12-week of their brand new IET (360° TitaniUM Core Power Exercise®) may elicit clinically important discounts (≥2 mmHg) in resting BP among hypertensive patients. 10 hypertensive participants were recruited from University of Malaya and neighbourhood community practice through email, posters and advertising. They have been included if they: (a) had a medical diagnosis of primary or idiopathic hypertension; (b) currently on anti-hypertension medications (β-blockers or/and non-dihydropyridine calcium channel blockers). Standards: a) not on hypertensive medication. b) had aims organ damage (i.e. heart failure, renal failure, hypertensive retinopathy or stroke).c) has some joint mobility problem particularly the shoulder. Participants coached 3 sessions for 12 weeks, 1 session/week they completed their intervention at the lab guided by the researcher and 2 sessions/week doing the new IET in the home. The new IET consisted of twelve core exercises and the participants completed the exercises in sequence with every workout session consisted of 10-20 seconds/exercise progressively, and 3 sets each session with all the rest phase of one minute between sets. Results shows 12 weeks of lab visits and home of fresh IET induced animportantdecrease in resting BP (Systolic Blood Pressure--SBP, Diastolic Blood Pressure-DBP & Mean Arterial Pressure-MAP) in medicated hypertensive patients. The finding in this research revealed that the reductions of resting BP had been ≥2 mmHg, it helped several studies utilized IET to makedecreases in resting BP in the healthy participants along with medication hypertensive patients. In conclusion, such an easily available and affordable IET programme might helps in lower a number of the major obstacles known to decreasecoaching adherence and will offer a more efficient lifestyle improvement to the prevention and treatment of hypertension.*

Keywords-- *A New Isometric Exercise Training, Resting Blood Pressure, 360° TitaniUM Core Strength Exercise®, Hypertensive Patients*

I INTRODUCTION

Exercise training Programs represent a widely Suggested Element in the prevention and treatment to reduce resting blood pressure (BP) could have significant implications for treatment of hypertension (Pescatello et al., 2019). A Huge and emerging body of evidence supports isometric exercise training (IET) as an effective workout modality to reduce resting BP in both normotensive and hypertensive populations (Badrov, Freeman, Zokvic,

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Millar, & McGowan, 2016; Bigliassi, Karageorghis, Bishop, Nowicky, & Wright, 2018; Devereux, Wiles, & Howden, 2015; Gill et al., 2015; Millar & Goodman, 2014; Wiles, Goldring, & Coleman, 2017).

In addition, the outcomes of 2 meta-analyses suggest that IET might be effective at eliciting greater BP reductions compared to traditional aerobic and resistance exercise training (Carlson, Dieberg, Hess, Millar, & Smart, 2014; Cornelissen, Fagard, Coeckelberghs, &Vanhees, 2011). As detailed in another meta-analyses (Owen, Wiles, & Swaine, 2010) isometric handgrip (IHG) and leg coaching are intriguing exercise alternatives which require considerably less time (~30--75 overall min/week) while documenting substantial reductions in resting BP in normotensive and {medicated|treated} hypertensive populations (Carlson et al., 2014; Millar, Levy, McGowan, McCartney, & MacDonald, 2013; Wiles et al., 2017).

Based on this accumulating evidence, the American Heart Association indicates that IET and specifically, isometric handgrip (IHG) training, could be utilized as a possible alternative approach to reduce resting BP Class Course IIB, Level of Evidence C) (Brook, Jackson, Giorgini, & McGowan, 2015).The development of the modality as a possible treatment plan for people with hypertension as well as the need for further research. The IHG is easily applicable (i.e. simple to work with and could be carried out anytime and anyplace), affordable, therefore accessible to the international population, and could be preferred by those who find physical activity non pleasant and may provide a valuable new therapeutic adjunct in the total method of treating hypertension. At such this technique was implemented utilizing a handheld digital handgrip dynamometer (Badrov et al., 2016; Millar et al., 2013), that guidesa person through an entire IET session and may, hence, be utilized without supervision} (Millar &Goodman, 2014) at the house.

Additionally, it's advised that the most of earlier IET research are commonly to have levied workout obstacles, such as time and cost that might lower the potency of IET because of potential physical treatment for changing BP (Millar, McGowan, Cornelissen, Araujo, & Swaine, 2014). It is preferred that an economical, home-based IET programmemight assist to encourage the usage of IET as useful device in the battle versus high blood pressure.Another workout style that might be moreappropriate for home-basedpreparation is the isometric wallsquat which utilises a stable position isometric contraction mode (Hunter, 2014), together with participants needed to retain their knee joint in a directed angle when encouraging a inertial load (body mass) with the quadriceps.

In literature research, the most commonly IET studies utilized alternative exercise mode with isometric handgrip (IHG), leg training and isometric wall squat. These exercise modes only concentrate on each arm and leg muscles documenting substantial decreases in resting BP in normotensive and treated hypertensive populations. The new IET (360° TitaniUM Core Strength Exercise®) consists of 12 isometric exercises performing in sequence and targeting on strengthened the core muscles, where by core in the human body has been described as a anatomical box comprising 29 pairs of muscles forming a leading (abdominals), back (paraspinals and gluteals) and base (pelvic floor and hip girdle) (Richardson, Jull, Hodges, & Hides, 1999). This new IET defined as an IET because it sustained muscle contraction (i.e. hike in pressure) without modifications in length of the involved muscle group. The new IET activated 29 pairs of core muscle when performed this exercise, theoretically it should be better mode of IET in significant reductions of resting BP if compared to hand or leg muscle group mode of isometric exercises.

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Additionally, the new IET can be another an alternative mode because it is an inexpensive and home-based IET which may remove the barriers of hypertensive patients enable them to carry out their exercise at home. Also, the new IET (360° TitaniUM Core Strength Exercise®) consists of12 isometric exercises is very easy and effortless to do, demands quite littleequipment, and is thus, accessible and economical.

Taken together, the main goal of this exploratory analysis was to explore if 12-week of the new IET (360° TitaniUM Core Strength Exercise®) willbring out clinically important reductions(≥2 mmHg) in resting BP among hypertensive patients. We hypothesised that a decrease in resting BP are the impacts of the new IET at 12-week. Additional to this, the secondary goal of the analysis was to investigate the recovery of resting BP will have occurred either 5 minutes or 10 minutes after performing the new IET.

II METHODS

Participants

Tenhypertensive participants had been recruited from University of Malaya and local community clinic through posters and email advert. They were included if they: a) had a medical diagnosis of primary or idiopathic hypertension; b) currently on anti-hypertension medications (β-blockers or/and non-dihydropyridine calcium channel blockers).Exclusion criteria: a) not on hypertensive medication; b) had targets organ damage (i.e. heart failure, renal failure, hypertensive retinopathy or stroke); c) has any joint mobility issue especially the shoulder. Screening included body mass and height measurements. A medical history and a list of current medication were also obtained in order to identify other cardiovascular diseases. Ten out of fifteen patients met the additional criteria, all participants gave written informed consent before participation, and also the University of Malaya Research Ethics Committee approved this study. Prior to testing, each participant gave a recorded explanation regarding these processes including any possible dangers. Participants performed a health and medical questionnaire and described that they weren't suffering from any other disease or injury.

Overall, five males and five females' hypertensive patients volunteered to participate, characteristics of the participants as table 1. All participants performed a familiarization visit to the laboratory and examining environment, followed by a baseline measurement session to evaluate resting BP. Within a week of evaluation testing, participants started the new IET training (3 times / week for 12 weeks). All participants had been familiarised with all the evaluation procedures and performing the new mode of IET. Before testing, participants claimed that an abstinence in food for 2 hours, caffeine for 4 hours, and also alcohol for 12 hours and completed without any strenuous workout 24 hours earlier.

Table 1: General Characteristics of the Participants (n=10)

Characteristics	Values
Age (Mean ± SD years)	46.1 ± 8.35
Gender	
Male	5 (50%)
Female	5 (50%)

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Ethnicity	
Malay (%)	10 (100%)
Weight (kg)	69.8 ± 10.95
Height (m)	1.58 ± 0.10
Body Mass Index (kg/m²)	27.96 ± 3.29
Period of Hypertensive Medication (Mean ± SD Years)	4.04 ± 4.12
Type of Medication	
ACE Inhibitor (%)	1 (10%)
Calcium Channel Blocker (%)	4 (40%)
Diuretic (%)	1 (10%)
B-Blocker (%)	4 (40%)
Monotherapy (%)	7 (70%)
Combination therapy (%)	3 (30%)

Values represented as mean ±SD, number of participants and percentage

Study design

This Study was conducted in Centre for Sport and Exercise Sciences. Baseline BP Measurements and the new IET were performed between 10:00am--1:00 pm in the Physiology laboratory. BP was measured with aneroid sphygmomanometer, Omron HEM7120 completely automatic digital blood pressure monitor using intellisense technologies for most precise measurement on dominant arm based on American Heart Association guidelines. This lab testing session has been repeated following 12 weeks of this new IET.

The new IET(360° Titanium Core Strength Exercise®)

Participants coached3 sessions for 12 weeks, one session/weekthey carried out their intervention in the laboratory guided by the researcher and two sessions/week performing the new IETat home. When performing the new IET at home, all participants were guided by a new IET programme booklet (Figure 1) provided to them. The new IET is a copyright protected under Copyright Act 1987 (Act 332) by the researcher (Figure 2). Each exercise session consisted of 10-20 seconds/exercise progressively (Table 2), 3 sets every session with the rest period of one minute between sets.

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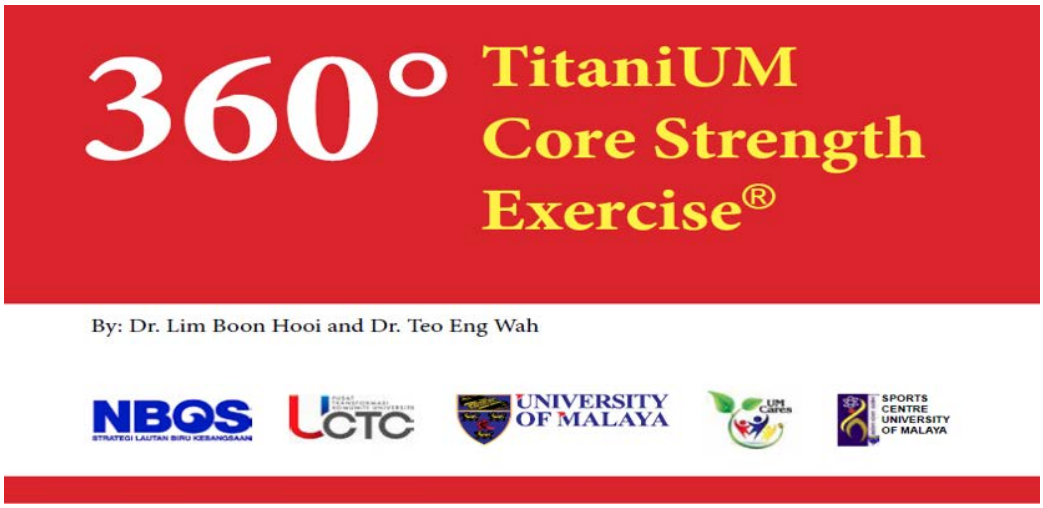

Figure 1: The New IET Programme Booklet

Figure 2: Copyright of The New IET Programme

The new IET consisted of twelve isometricexercises: 1). double elbow prone bridge;2). right elbow lateral bridge;3). both legs supine bridge; 4). left elbow lateral bridge;5). both hand prone bridge;6). right hand lateral bridge:7). left leg up supine bridge; 8). right leg up supine bridge;9). left hand lateral bridge;10). alternate left hand right leg;11). alternate right hand left leg;12). superman. All these exercises should have performed in sequence as figure 3.

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1

360° TitaniUM Core Strength Exercise®

1. Both Elbow Prone Bridge

Lie on your stomach. Raise your body up so that you are resting on your forearms and elbows. Align your head and neck with your back and place your shoulders directly above your elbows. Tighten your abdominal muscles.

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

5

2

360° TitaniUM Core Strength Exercise®

2. Right Elbow Lateral Bridge

Lie on your right side, raising your body resting onto your right elbow and forearm. Rest your right arm along the side of your body. Place your left shoulder and arm directly above your right elbow, keep your shoulders, arm, hips and knees in alignment. Tighten your abdominal muscles.

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

6

3

360° TitaniUM Core Strength Exercise®

3. Both Legs Supine Bridge

Lie on your back with your knees bent (45° off ground). Keep your back in a neutral position, not arched and not pressed on the ground. Avoid tilting your hips. Straighten your hands on the ground pointing away from your head. Slowly raise your hips off the ground until your hips are aligned with your knees and shoulders. Tighten your abdominal muscles.

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

7

4

360° TitaniUM Core Strength Exercise®

4. Left Elbow Lateral Bridge

Lie on your left side, raising your body onto your left elbow and forearm. Rest your left arm along the side of your body. Place your right shoulder and arm directly above your left elbow, keep your right shoulders, arm, hips and knees in alignment. Tighten your abdominal muscles.

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

8

5

360° TitaniUM Core Strength Exercise®

5. Both Hand Prone Bridge

Lie on your stomach. Raise your body so that you are resting on your palm. Align your head and neck with your back and place your shoulders directly above your palm. Tighten your abdominal muscles.

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

9

6

360° TitaniUM Core Strength Exercise®

6. Right Hand Lateral Bridge

Lie on your right side. Then, slowly raise and balance yourself supported by your right forearm and arm. Place your left shoulder and arm directly above your right forearm, keeping your left shoulders, arm, hips and knees in alignment. Tighten your abdominal muscles.

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

10

7

360° TitaniUM Core Strength Exercise®

7. Left Leg Up Supine Bridge

Lie on your back with your knees bent (45° off ground). Keep your back in a neutral position, not arched and not pressed on the ground. Avoid tilting your hips. Straighten your hands on the ground pointing away from your head. Slowly raise your hips off the ground until your hips are aligned with your knees and shoulders. Tighten your abdominal muscles. Then raise your left leg off the ground in alignment with your head, chest and hip

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

11

8

360° TitaniUM Core Strength Exercise®

8. Right Leg Up Supine Bridge

Lie on your back with your knees bent (45° off ground). Keep your back in a neutral position, not arched and not pressed on the ground. Avoid tilting your hips. Straighten your hands on the ground pointing away from your head. Slowly raise your hips off the ground until your hips are aligned with your knees and shoulders. Tighten your abdominal muscles. Then raise your right leg off the ground in alignment with your head, chest and hip.

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

12

9

360° TitaniUM Core Strength Exercise®

9. Left Hand Lateral Bridge

Lie on your left side. Then, slowly raise and balance your body on your left forearm and palm. Place your right shoulder and arm directly above your left forearm, keeping your right shoulders, arm, hips and knees in alignment. Tighten your abdominal muscles.

Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

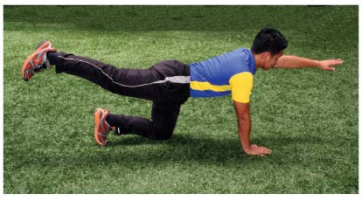
13

10

360° TitaniUM Core Strength Exercise®

10. Alternate Left Hand and Right Leg

Start on your hands and knees on the ground. Place your right hand directly below your shoulder and align your head and neck with your back. Raise your right leg off the ground then slowly raise your left arm. Tighten your abdominal muscles.



Hold for 10-20 seconds (non-athlete) and 20-30 seconds (athlete).

14

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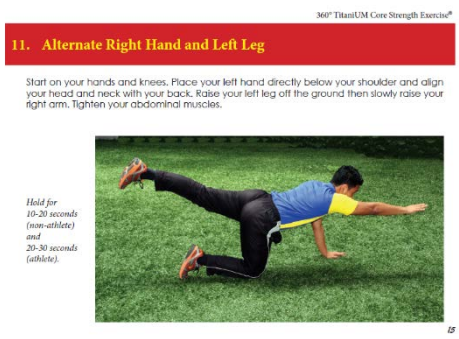

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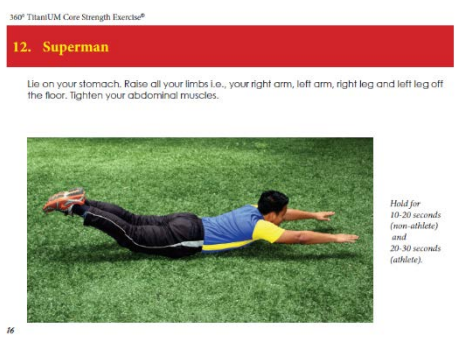

Figure 3: Sequence of Performing the 360° TitaniUM Core Strength Exercise®

Each exercise has to be maintained for 10 seconds in the first month and increases progressively in duration to perform these exercise from 10 seconds to 20 seconds as table 2. The researcher monitored during the participants performing these exercises to ensure that the technique is correct and timing each exercise during laboratory visits.

Table 2: Schedule of Performing the New IET Programme

Month	Frequency	Duration	Set
First month	3 sessions/week (1 session in laboratory guided by researcher and 2 sessions guided by the booklet at home)	10 seconds/exercise	3
Second month	3 sessions/week (1 session in laboratory guided by researcher and 2 sessions guided by the booklet at home)	15 seconds/exercise	3
Third month	3 sessions/week (1 session in laboratory guided by researcher and 2 sessions guided by the booklet at home)	20 seconds/exercise	3

On each lab trip, participants rested at a seated posture for 10 minutes and resting BP were also measured. After finishing the measurement of resting BP, participants completed the new IET guided by the researcher with the same duration and repetition when they carried their own training at home. Baseline resting BP was assessed prior to each IET session to look into the impacts of the new IET on resting BP adaptations. After each IET

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session, participants were requested to rest in the lab and the second resting BP were assessed in 5 minutes after completion of the new IET and third resting BP were assessed in 10 minutes after the completion of the new IET, measurement of resting BP and resting HR were taken concurrently.

III EXPERIMENTAL MEASURES

All testing was done in a quiet, darkened, and also temperature-controlled lab (20--24°C). All repeat testing (i.e., for 12 weeks of new IET) was ran testing time daily according to their own schedule set by them. All coaching sessions were divided by a minimum of 1 day of relaxation. Participants have to complete training log books maintaining the date of exercise,

IV STATISTICAL ANALYSIS

These data are expressed in mean and standard deviations (Mean ± SD). One Way ANOVA with repeated measures was used to check for the effects of time (Baseline, 5 minutes after and 10 minutes after). When required, Bonferroni post hoc processes were utilized to evaluate certain differences between means. Estimates of effect size are supplied as Cohen's d values (d = 0.2, small impact; d = 0.5, moderate influence; d = 0.8, large influence). All statistical analyses were completed with IBM SPSS Statistics for Windows, version 23, Armonk, NY: IBM Corporation along with the significance level was set at $P < 0.05$.

V RESULTS

All participants (n = 10) adhered and completed the required 36 sessions of the new IET over 12 weeks training period (one session in laboratory guided by researcher and two sessions at home guided by the booklet provided to them). Prior to eachtraining session in the laboratory, resting steps were listed for each participant throughout their 12 visits to this lab. All participants were informed not to alter within their prescribed medications over the duration of the study.

Comparison of Systolic Blood Pressure (SBP) in Three Time Frames

To examinewhen the reductions of SBP will have occurred either 5 minutes or 10 minutes after performing the new IET, a one-way repeated measures ANOVA was conducted to compare the mean of SBP in baseline, 5 minutes and 10 minutes after performing the new IET.The data obtained violated the assumption of Sphericity, mean scores reported utilizing an ANOVA repeated steps with the Greenhouse-Geissermodificationsfor SBP were statistically significance different, $F(1, 9) = 1.07$, $p<0.05$, $\eta p^2= 0.96$.

Three paired samples t-tests were utilized to create Bonferroni post-hoc correction comparisons among conditions. A initial paired trials t-test suggested that there was no significant difference in SBP for baseline (M=133.24, SD=10.33) and 5 minutes after (M=248.19, SD=352.87;$t(9)= -1.02$; $p>0.05$).A second paired samples t-test pointed that there was a particular difference in the scores for baseline (M=133.24, SD=10.33) and 10 minutes after (M=130.62, SD=10.12; $t(9)= 13.90$; $p<0.05$). A third paired samples t-test pointed that there

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wasn't significant difference in the scores for 5 minutes after (M=248.19, SD=352.87) and 10 minutes after (M=130.62, SD=10.12; t(9)= 1.04; p > 0.05. Comparison of SBP shown in figure 4

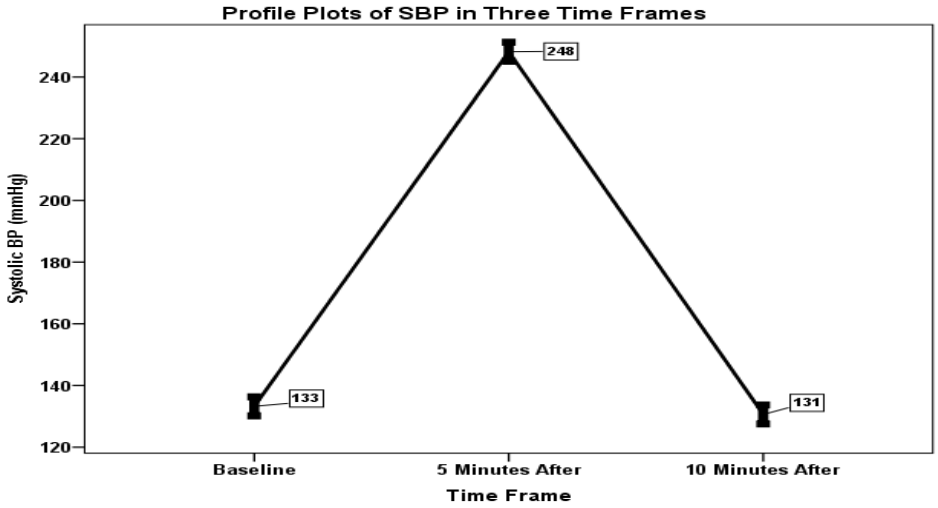

Figure 4: Comparison of SBP in Three Time Frames

Comparison of Diastolic Blood Pressure (DBP) in Three Time Frames

A repeated measures ANOVA with Sphericity Assumed determined that the DBP varied statistically significant between the three time frames ($F(2,18)=12.36$, $p<0.05$, $\eta p^2= 0.58$. Post hoc tests utilizing Bonferroni disclosed that the DBP elicited slightly increased from baseline (M=83.51mmHg, SD=7.84) to 5 minutes after exercise (M=83.59mmHg, SD= 6.98), which was not statistically significant (t(9)= -0.10; p>0.05). However, the DBP of 5 minutes after the exercise (M=83.59mmHg, SD= 6.98) had been reduced to 10 minutes after the exercise (M=79.64mmHg, SD=5.63), which was statistically significant (t(9)= 4.20; p<0.05). Comparison of the DBP between the baseline (M=83.51mmHg, SD=7.84) with the 10 minutes after exercise (M=79.64mmHg, SD=5.63) also revealed that statistically significant (t(9)= 4.06; p<0.05). Comparison of DBP in three time frames with the profile plots shown in figure 5.

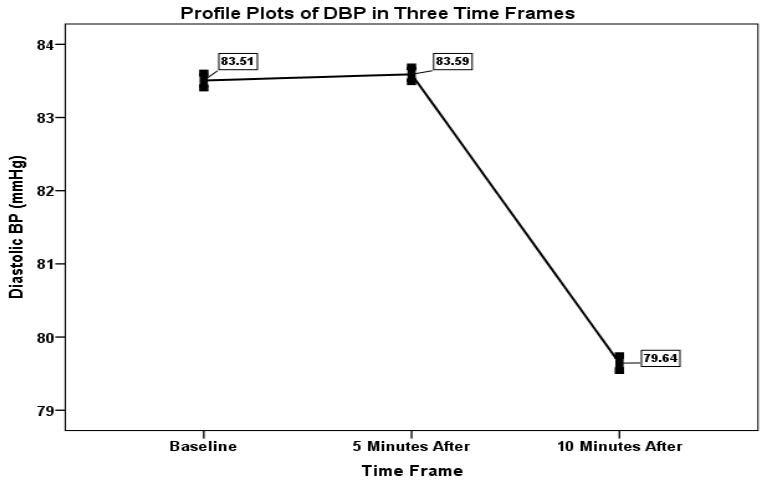

Figure 5: Comparison of DBP in Three Time Frames

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Comparison of Mean Arterial Pressure (MAP) In Three Time Frames

A significant value for Mauchly's Test of Sphericity (p=0.02) indicates that the assumption of homogeneity of covariances has been violated, the results of the one-way repeated-measures ANOVA with a Greenhouse-Geisserrectificationsshowed that there was a significant main effect of the new IET upon the reductions of MAP ($F(1.21, 10.91) = 10.42$, $p < 0.05$, $\eta p2=0.89$). Bonferroni post hoc tests showed that the MAP increased from baseline (M=98.82mmHg, SD= 6.46) to 5 minutes after exercise (M=99.32mmHg, SD= 5.78),butnot statistically significant ($t(9)=-0.75$; $p>0.05$). Comparison of MAP from the baseline (M=98.82mmHg, SD= 6.46) was statistically significant if compared with the MAP of 10 minutes after exercise (M=96.94mmHg, SD=6.83, $t(9)=7.62$; $p<0.05$). Comparison between 5 minutes after exercise (M=99.32mmHg, SD= 5.78) with 10 minutes after exercise (M=96.94mmHg, SD=6.83) also revealed significantly differed ($t(9)=3.79$; $p<0.05$).Comparison of MAP in three time frames with the profile plots shown in figure 6.

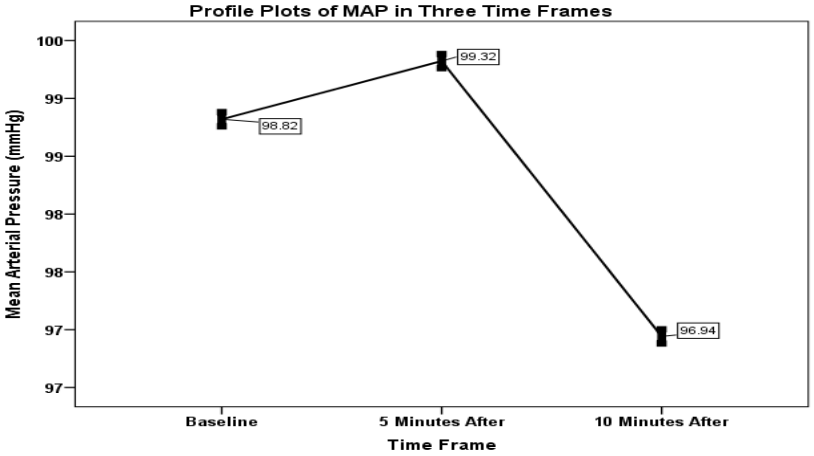

Figure 6: Comparison of MAP in Three Time Frames

VI DISCUSSIONS

In current study, 12weeks of laboratory plus home-based of new IET induced a significant reduction of resting BP (SBP, DBP &MAP) in medicatedhypertensive patients. The resting BP reductions werealike in magnitude to theformerly reported subsequent to IET whichhas beento some extent labbased along with the participants executingsustained force contractions (Millar et al., 2013; Millar et al., 2014)with bilateral-leg IET utilizing the same acute programme variables and exercise force in a lab setting. As a result, the novel of new IET protocol employed in this study occurs to give a feasible alternative lab plus home-based procedure for scaling down of resting BP.

Important to point out that the hemodynamic effects of the study confirm earlier findings from medicated hypertensive participants (Taylor, McCartney, Kamath, & Wiley, 2003), that reported important reductions in SBP or DBP after Isometric Handgrip (IHG) training. At such, another innovative feature of the present study shows that in medicated hypertensive participants, even the new IET has important resting BP outcomes.

The finding in the study showed that reductions of resting BP was ≥ 2 mmHg, it supported several studies used IET to cause reductions in resting BP in both healthy participants along with medication hypertensive

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patients (Millar et al., 2013; Taylor et al., 2003; Wiley, Dunn, Cox, Hueppchen, & Scott, 1992). Greater insight to the effects of IET on minimal clinically important difference (MCID) (Page, 2014), the meta-analyses of all IET research reported moderate reductions in resting BP which were significant −6.77 to −10.9 mmHg SBP and −3.9 to −6.7 mmHg DBP (Carlson et al., 2014; Cornelissen et al., 2011; Owen et al., 2010). The reduction in BPS and BPD ≥ 2 mmHg is considered clinically significant, because it is related to substantial risk reduction in the occurrence of heart failure one of normo- and hypertensive individuals. Clinically meaningful blood pressure reductions with reduced intensity isometric handgrip exercise. Decline in BPS reduces stroke and coronary heart disease deaths rate by 6% and 4%, respectively; reduction of 5 mmHg will can cause cuts of 14% and 9%, respectively (Piikmann& Reisberg, 2018).

In current study, the intervention period was set for 12 weeks and the intervention was on medicated hypertensive patients because no study has been carried out the verify the effectiveness of this new IET with this group of patients before. Previous study reported that following 4 weeks home-based isometric wall squat coaching can bring out clinically important reductions in resting SBP, DBP and MAP in healthy normotensive men. Additionally, some IET studies with bigger muscles mass lower body workout which have managed to create reductions in all three BP parts (SBP, DBP, and MAP) after ≤8 weeks of isometric leg training (Devereux et al. 2010; Wiles et al. 2010; Gill et al. 2015). However, other discovery reported no significant differences in any resting BP parameters in 4 weeks when bilateral-leg extension was done at an average of 85% HR peak, but important reductions in SBP and MAP in the end of 8 weeks, whereas another study revealed that all parameters of resting BP were significantly decreased after just 3 weeks of bilateral-leg IET, however just when IET happened at a greater intensity (~100% HR peak or 34% MVC) (Gill et al., 2015).

However, all these earlier studies utilized bilateral-leg expansion that needed specialised equipment only offered in a few sport and exercise science labs. Therefore, the available and possibly economical training of the new IET protocol in present study might help to improve isometric exercise's effectiveness as a physical therapy for changing resting BP, the major differences between current study with previous studies were the type of subjects, gender, location of intervention and intervention duration.

The new IET used involves 12 isometric exercises, performing in sequence and targeting on 29 pairs of core strength muscles. At such, theoretically, it could be argued that the new IET may lead to both a larger magnitude (and maybe an increased speed) of resting blood pressure reduction in comparison to some other IET (isometric hand grip, bilateral-leg expansion exercise and also isometric wallsquat). This can be based initially on the fact that isometric hand grip isolate on arm muscles (Pescatello et al., 2019), leg extensions isolate |both the quadriceps and wallsquatexercise utilize a smaller muscle mass in comparison with all the new IET, that uses additional muscle groups It's been hypothesised that isometric contractions of some larger muscle mass demands an increased central and peripheral push (Mitchell, 1991; Soares etal., 2019).

After more muscles recruited to perform the new IET, therefore, the cardiovascular management centres will be stimulated in parallel manner using all the motor cortex (Franke, Boettger,& McLean, 2000), thereby generating a bigger increase in cardiovascular reaction (a probable stimulus for resting BP adaptation) through larger central control (Soares et al., 2019). Furthermore, evidence indicates that increased motor unit recruitment additionally enriches the exercise pressor reaction (Seals et al., 1985) because of either greater physical

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deformation that stimulates the mechanoreceptors (Soares et al., 2019) and/or enhanced metabolite production activating themetaboreceptors (Iellamo, Massaro, Raimondi, Peruzzi, &Legramante, 1999).

To find out how fast is the recovery after performing the new IET, we first measured BP 5 min after training, we noticed that 5 minutes after performing the new IET, the resting BP increases, the current results similar to the findings by (Piikmann& Reisberg, 2018) demonstrated that 1 min after handgrip workout, BP was still statistically importantly enhanced compared to baseline. But current results were contradicting to the findings reported (Souza et al., 2019) by 5 mins after coaching BP had returned into pre-training values. Interestingly, in current study, the BP in 10 minutes after training revealed that statistically significant reductions if compared to the baseline. The results were similar to the findings reported by (Souza et al., 2018) which measured 1 hour after IET revealed significant reductions of BP. Another study revealed that 3 hours following isometric training BPS along with BPD were statistically significantly decreased (5.1 mmHg and 1.6 mmHg, respectively) along with the reduction in BPS was also clinically significant. Also, the other study revealed that BPS increases nearly linearly with age, together with 90% likelihood growing hypertension (Goessler, Buys, VanderTrappen, Vanhumbeeck, & Cornelissen, 2018).

On the other hand, previous study reported that isometric handgrip doesn't bring out cardiovascular overburden or post-exercise hypotension in hypertensive older females because didn't observe any important changes in BP (Souza et al., 2019) however in alternative research statistically sustantial decrease in BP has been discovered. It's challenging to describe the differences between the outcomes between the research because outcomes might have been affected by the age, because the subjects from the analysis wereolder (71 years) with hypertension, and also in the other analysis that the subjects were considerably younger(Souza et al., 2019).

In summary, the present study shows those 12 weeks of laboratory also as home-based of new IET canelicit clinically important reductions in resting SBP, DBP, and MAP in treated hypertensive patients. This kind of accessible and cheap IET programme might assist reduce some of the essential challenges known to decrease exercise adherence and can offer a more successful lifestyle modification for the avoidance of hypertension. Hypothetically, when this new IET can help to lower BP, the individual could exercise a few times every day and often for more pronounced and long lasting impact on BP, since training takes just a few minutes and may be done literally anywhere. This may possibly prevent and reduce the threat problems linked to high blood pressure (Piikmann& Reisberg, 2018).

VII STUDY LIMITATIONS

The medication condition of the sample is varied, with all the results of long-term anti-hypertensive treatment on adaptations of cardiac autonomic modulation after workout coaching mostly unknown. The sample size used within this research wasn't enough to address possible relationships between anti-hypertensive type as well as the new IET adaptations. Additional analysis of possible pathways involved with new IET adaptations in BP and autonomic function are essential.

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IX CONFLICT OF INTEREST

The authors declare no conflict of interest.

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