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1   Can blood pressure decrease after maximal exercise test predict the blood pressure lowering effect of

2   aerobic training in treated hypertensive men?

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4   Luan Morais Azevêdo[1][*]; Leandro Campos de Brito[1][*]; Tiago Peçanha de Oliveira[1]; Rafael Yokoyama

5   Fecchio[1]; Rafael Andrade Rezende[1]; Giovânio Vieira da Silva[2]; Andrea Pio de Abreu[2]; Décio Mion

6   Junior[2]; John Robert Halliwill[3]; Cláudia Lúcia de Moraes Forjaz[1][†]

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8   [1] Exercise Hemodynamic Laboratory, School of Physical Education and Sport, University of São Paulo,

9   São Paulo, Brazil;

10 [2] Hypertension Unit, Hospital das Clínicas, Medical School, University of São Paulo, Brazil;

11 [3] Department of Human Physiology, University of Oregon, Eugene, Oregon, USA.

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14 [†] **Correspondence author:** Cláudia Lúcia de Moraes Forjaz

15 School of Physical Education and Sport, University of São Paulo, São Paulo, Brazil.

16 Av. Professor Mello Moraes, 65 - Cidade Universitária, São Paulo, SP

17 Zipcode 05508-030, Brazil. E-mail: cforjaz@usp.br

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19 [*] These authors contributed equally to this manuscript

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What is known about this topic

- Significant correlations have been reported between the reductions in blood pressure observed after a maximal exercise test and after a period of aerobic training in healthy individuals.

- Blood pressure decrease observed after a maximal exercise test may be used to predict the blood pressure lowering effect of aerobic training in hypertensives.

What this study adds

- The decrease in blood pressure observed 30 min after a maximal exercise test was not associated with the blood pressure reduction induced by aerobic training in treated hypertensive men.

- The blood pressure reduction observed 30 min after a maximal exercise test cannot be used to predict hypertensives responders or non-responders to the blood pressure lowering effect of aerobic training.

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40   **Abstract**

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42   The acute decrease in blood pressure (BP) observed after a session of exercise (called post-exercise

43   hypotension) has been proposed as a tool to predict the chronic reduction in BP induced by aerobic

44   training. Therefore, this study investigated whether post-exercise hypotension observed after a maximal

45   exercise test is associated to the BP-lowering effect of aerobic training in treated hypertensives. Thirty

46   hypertensive men (50±8 years) who were under consistent anti-hypertensive treatment underwent a

47   maximal exercise test (15 watts/min until exhaustion), and post-exercise hypotension was determined

48   by the difference between BP measured before and at 30 min after the test. Subsequently, the patients

49   underwent 10 weeks of aerobic training (3 times/week, 45 min/session at moderate intensity), and the

50   BP-lowering effect of training was assessed by the difference in BP measured before and after the

51   training period. Pearson correlations were employed to evaluate the associations. Post-maximal exercise

52   test hypotension was observed for systolic and mean BPs (-8 ± 6 and -2 ± 4 mmHg, all $P<0.05$). Aerobic

53   training reduced clinic systolic/diastolic BPs ($-5 \pm 6/-2 \pm 3$ mmHg, both $P<0.05$) as well as awake and

54   24h mean BPs (-2 ± 6 and -2 ± 5 mmHg, all $P<0.05$). No significant correlation was detected between

55   post-exercise hypotension and the BP-lowering effect of training either for clinic or ambulatory BPs (r

56   values ranging from 0.00 to 0.32, all $p > 0.05$). Post-exercise hypotension assessed 30 min after a

57   maximal exercise test cannot be used to predict the BP-lowering effect of aerobic training in treated

58   hypertensive men.

59

60   **Keywords:** Aerobic exercise; Maximal Exercise Test; Post-Exercise Hypotension; Clinic Blood

61   Pressure; Ambulatory Blood Pressure; Hypertension.

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64 **INTRODUCTION**

65   Hypertension is an idiopathic chronic disease, affecting 31% of adults worldwide, and indirectly

66 responsible for about 14% of the all-cause deaths [1]. Although pharmacological treatment decreases

67 blood pressure (BP), rates of BP control are still low (approximately 30%) [2], and a better control may

68 be obtained by its association with aerobic training (AT) [3–5]. Strong evidence shows that AT reduces

69 clinic and ambulatory BPs in hypertensives [6] with the magnitude of reduction being similar to the

70 pharmacological treatment [7]. Therefore, AT is recommended for hypertension treatment [3–5], but

71 approximately 25% of the hypertensives may not respond to AT with BP decrease [8], being important

72 to find tools to detect these non-responder patients.

73   A single session of aerobic exercise induces an acute and long lasting decrease in BP during the

74 post-exercise period that has been called post-exercise hypotension (PEH) [9–11]. It has been proposed

75 that PEH may be used to predict the chronic BP-lowering effect of AT [10, 11]. Therefore, for clinical

76 application, it would be useful if PEH after a maximal exercise test, a procedure already used in the pre-

77 training screening of hypertensives [3, 12], could predict the BP-lowering effect of AT.

78   Some studies reported strong correlations between the BP decrease observed after a maximal

79 exercise test and the BP reduction obtained after a period of AT in healthy individuals [13, 14]. However,

80 this association was not found in patients with chronic kidney disease who were receiving

81 antihypertensive drugs [15], suggesting that it might not happen in treated hypertensives, which needs

82 to be checked. Additionally, the studies reporting significant associations have employed the same initial

83 BP to calculate both, PEH and the BP-lowering effect of AT [13, 14]. This procedure might result in a

84 mathematical coupling known as regression to the mean that is a well-known experimental pitfall, and

85 can lead to spurious significant correlations [16, 17]. Thus, a more robust experimental design is still

86 needed to confirm the association.

87   Therefore, the present study investigated the association between PEH after a maximal exercise

88 test and the BP-lowering effect of AT in hypertensive men receiving antihypertensive medication and

89 used different initial BPs to calculate PEH and the BP-lowering effect of AT.

90

91 **METHODS**

92   This study employed secondary data from a randomized controlled trial designed to compare

93 the BP-lowering effects of morning and evening AT in treated hypertensive men. The main results were

94 published elsewhere [18]. The study was approved by the Research Ethical Committee of the School of

95 Physical Education and Sport (no. 966.072) and registered in the Brazilian Clinical Trials platform

96 (RBR-7q7pz7). All patients signed a written consent form before enrollment.

97

98 *Subjects*

99   The patients were recruited through printed and digital media. As study's criteria, patients

100 should: i) be male; ii) age between 30 and 65 years old; iii) present hypertension and be taking

101 antihypertensive medications with classes and doses constant for at least the last 4 months; iv) have

102 resting systolic/diastolic BP ≤ 160/105 mmHg; v) present neither chronotype (i.e. scores between 41

103 and 59 in the Horne and Ostberg morningness-eveningness questionnaire); vi) not be taking β-blockers

104 or dihydropyridine calcium channel blockers; (vii) be nonactive (practicing < 150 min/week of physical

105 activity according to the International Physical Activity Questionnaire); and viii) not have physical

106 limitations to perform aerobic exercise. The patients were excluded if they presented: i) obesity at stage

107 2 or higher (i.e. body mass index ≥ 35 kg/m^2); ii) diabetes with complications or in use of insulin; iii)

108 hypertensive target-organ damage; iv) other cardiovascular diseases besides hypertension; and v)

109 electrocardiogram abnormality at rest or during an exercise test.

110

111 *Preliminary Exams*

112   To check accomplishment to the study's criteria, the patients underwent preliminary

113 evaluations. They were interviewed regarding their health history, medication use and physical activity

114 practice, and answered the Horne and Ostberg's morningness-eveningness [19] and the International

115 Physical Activity [20] questionnaires. They underwent a clinical exam performed by a physician, and

116 their body mass and height were measured. Their BP was measured three times after 5 min of seated

117 rest on two different occasions. Finally, blood and urine samples were collected to evaluate the presence

118 of secondary hypertension and target-organ damage according to the Brazilian Guideline for

119 Hypertension [3].

120

121 ***Procedures***

122   Before and after 10 weeks of AT, the patients who fulfilled the study's criteria attended to the

123 laboratory for two different visits conducted with an interval of at least 48h. One visit was dedicated to

124 evaluate PEH by measuring BP before and at 30 minutes after a maximal exercise test. The other visit

125 was used to evaluate the chronic BP-lowering effect of AT by measuring clinic and ambulatory BP.

126 After the training period, the visits were conducted at least 48 hours after the last training session.

127

128 *Assessment of PEH after the maximal exercise test*

129   Maximal exercise test was conducted in a temperature controlled (20-22ºC) laboratory between

130 7 and 9 a.m. The patients were instructed to have a light meal two hours before, to avoid caffeinated

131 beverages and smoking in the testing day, and to avoid alcoholic drinks and vigorous physical efforts in

132 the previous 24 hours. The test was carried out on a cycle ergometer (Lode Medical Technology,

133 Corival, Groningen, Netherland) with a ramp protocol of 15 watts increment each minute until the

134 patients were unable to keep pedaling frequency at 60 rpm. The test was preceded by a 3-min warm-up

135 at 30 watts and followed by a 5-min cool-down period pedaling at 30 watts. During the test, auscultatory

136 BP (Unitec, São Paulo, Brazil) was measured every two minutes, electrocardiogram (EMG System,

137 030110/00B, São Paulo, Brazil) was continuously recorded, and breath-by-breath oxygen consumption

138 (VO_2) was continuously analyzed by a metabolic card (CPX Ultima, Medical Graphics Corporation, St.

139 Paul, MN). VO_2peak was considered as the highest value achieved during exercise in means of 30s. For

140 10 min before and 30 min after the test, the patients rested seated on a comfortable chair. At the end of

141 each of these moments, BP was measured three times with an interval of 1 min, and the mean value was

142 calculated. The measures were taken by an experienced evaluator, using the auscultatory method and a

143 mercury column sphygmomanometer (Unitec, São Paulo, Brazil). PEH was calculated by the difference

144   between the BP measured after (at 30 min) and before the maximal exercise test conducted before the

145   training period.

146

147   *Assessment of the effect of AT on clinic and ambulatory BPs*

148   Before and after the training period, in a visit different from the maximal test, clinic BP was

149   measured using the auscultatory method and a mercury column sphygmomanometer (Unitec, São Paulo,

150   Brazil). The measurements were performed 3 times after 5 min of seated rest and with an interval of 1

151   min between the measures. The mean of the three measures was considered as the clinic BP. In the same

152   day, an oscillometric ambulatory BP monitor (Spacelabs Healthcare, 90207, USA) was positioned on

153   the non-dominant arm of the patients, and they left the laboratory being instructed to perform their

154   normal daily activities and to come back to the laboratory after 24h. The monitor was programmed to

155   take measures every 15 min for 24 hours, and the patients were instructed to avoid physical efforts

156   during the monitoring. Additionally, they should record their daily activities and take notes regarding

157   the time of sleeping and awaking. In the monitoring conducted after the training period, the patients

158   were asked to keep the same daily activities as in the pre-training monitoring. For analyses, only records

159   that presented at least 85% of the measures valid were considered. Twenty-four hour, asleep and awake

160   BP were calculated, respectively, by the average of all measures taken during whole monitoring period,

161   the period that the patient reported to be sleeping and the period that he reported to be awake. The clinic

162   BP-lowering effect of AT (Δclinic BP) was determined by the difference in clinic BP measured after

163   and before the training period, while the ambulatory BP-lowering effect of AT (Δambulatory BP) was

164   determined by the difference in 24-h, awake and asleep BP assessed after and before the training period.

165

166   *AT protocol*

167   AT was performed on cycle ergometer (CEFISE, Biotec 2100, Campinas, Brazil), 3 times per

168   week for 10 weeks. Training duration and intensity progressed along the training period. Exercise

169   duration increased from 30 to 45 min in the first two weeks of training and this duration was maintained

170   until the end of the training period. Exercise intensity was set at the heart rate of the anaerobic threshold

171 during weeks 1 to 4 and increased progressively to achieve 10% below the heart rate of the respiratory

172 compensation point at weeks 9 and 10. The maximal exercise test conducted before the training period

173 was used to establish the anaerobic threshold and the respiratory compensation point according to

174 literature criteria [21]. During the training sessions, heart rate was monitored (POLAR 800cx, Kempele,

175 Finland) to keep intensity within the desirable range.

176

177 *Statistical Analysis*

178 Since this study used a database from a bigger study [18], sample size was originally calculated

179 for the main variable of the bigger study and accepted by convenience for this investigation. Normality

180 of data was evaluated by Shapiro-Wilk test. Paired t-test were used to confirm the occurrence of PEH

181 (pre- vs. post-maximal exercise test) and the effect of AT (before vs. after training). Pearson correlations

182 and linear regressions were used to analyze the association between PEH and the clinic and ambulatory

183 BP-lowering effect of AT. The analyses were performed in SPSS software (SPSS for windows; IBM,

184 Chicago, IL). Data were expressed in mean ± standard deviation, and the level of significance adopted

185 was $p \leq 0.05$.

186

187 **RESULTS**

188

189 A total of 68 patients signed the informed consent form to participate. After checking for the

190 study criteria, 32 were excluded. Therefore, 36 patients were enrolled in the experimental protocol, but

191 during the training phase, 6 patients dropped out. Thus, 30 patients finished the study′s protocol and had

192 their data analyzed (Figure 1).

193

194 **[FIGURE 1 ABOUT HERE]**

195

196   The sample was composed by middle-aged hypertensive men, taking different types of

197 antihypertensive drugs, mostly as monotherapy (Table 1). Maximal exercise tests were interrupted by

198 fatigue in all patients.

199

200   **[TABLE 1 ABOUT HERE]**

201

202   Adherence to training sessions was 96 ± 4%. VO$_2$peak increased significantly after AT

203 (VO$_2$peak = 21.4 ± 3.3 vs. 23.1 ± 4.2 mL.kg^{-1}.min^{-1}, p = 0.04), while weight did not change (88.6 ± 13.3

204 vs 88.3 ± 13.0 kg, p = 0.21).

205   Maximal exercise test promoted PEH, significantly reducing systolic and mean BPs, but not

206 diastolic BP (Table 2). AT decreased clinic systolic, diastolic, and mean BPs (Table 3). Considering

207 ambulatory BP, AT significantly reduced 24h and awake mean BPs; tended to reduce 24h and awake

208 diastolic BPs; and did not significantly change 24h, awake and asleep systolic BPs nor asleep diastolic

209 and mean BPs (Table 3).

210

211   **[TABLE 2 AND 3 ABOUT HERE]**

212

213   Considering the main objective of the study, no significant association was observed between

214 the systolic or diastolic BP changes observed after the maximal exercise test (PEH) and the changes in

215 clinic or ambulatory BPs observed after AT (Table 4, Figure 2).

216

217   **[TABLE 4 AND FIGURE 2 ABOUT HERE]**

218

219 **DISCUSSION**

220   This study investigated the association between PEH assessed 30 min after a maximal exercise

221 test and the chronic BP reduction induced by AT in treated hypertensive men using an experimental

222 design that overcame previous limitations. The existence of such association would have supported the

223   use of BP reduction observed after a maximal exercise test as a clinical tool to identify those

224   hypertensives who would mostly respond to AT with BP reduction. However, contrary to this

225   expectation, the main finding of the present study was that there was no association between PEH

226   assessed 30 min after a maximal exercise test and either the clinic or the ambulatory BP reduction

227   induced by 10 weeks of AT.

228   In the present study, maximal exercise test induced PEH, decreasing systolic BP by -7.6 ± 5.7

229   mmHg, which is in accordance with the previous studies that also reported PEH after maximal exercise

230   tests in health individuals [13, 14]. Additionally, as expected, AT increased VO_2peak as previously

231   reported [18], and promoted significant reductions in clinic systolic/diastolic BPs ($-4.6 \pm 6.4 / -1.8 \pm 3.2$

232   mmHg) as well as in some parameters of ambulatory BP (24h and awake mean BPs, -2.1 ± 4.9 and -2.3

233   ± 6.0 mmHg, respectively). These BP reductions were lower than those reported in a recent meta-

234   analysis [6], but may have clinical importance since a -5 mmHg decrease in clinic systolic BP may be

235   associated with a reduction of 14% in the risk of death from stroke and 9% from coronary heart disease

236   [22].

237   Regarding the use of PEH after a maximal test to predict the BP-lowering effect of AT, the

238   present findings do not support this application in treated hypertensive men as no significant association

239   was observed between the acute and chronic responses of BP to aerobic exercise. This absence of

240   association was also reported in patients with chronic kidney disease [15], but differs from prior findings

241   of strong associations reported in healthy individuals [13, 14]. Some factors may be raised to explain

242   the discrepancy among the studies. First, the time after the maximal exercise test when PEH was

243   assessed may influence the association. The previous studies that have reported significant associations

244   assessed PEH at 7 [14] and 60 min [13] after the maximal exercise test, while the present study assessed

245   PEH at 30 min, a midpoint between these periods, which suggests that the time of measurement may

246   not have been the reason for the absence of association. However, a recent review conducted by our

247   group [23] reported that in many studies the greatest PEH happened after 30 min of recovery, being

248   possible that the use of other specific times points or the greatest reduction in BP after the exercise test

249   could reveal a different result from using the assessment at 30 min of recovery. Nevertheless, this time

250 point was employed in the present study based on the previous studies that have employed maximal

251 exercise tests and on the feasibility in clinical routine, where a long-term assessment after a maximal

252 exercise test is difficult. Another possible reason for the difference in the results of the present study in

253 comparison with those that found significant correlations is the use of antihypertensive medication that

254 may affect the relationship between the acute and the chronic responses of BP to exercise. Along this

255 line, a recent meta-analysis concluded that PEH is less evident in patients receiving anti-hypertensive

256 drugs [9], while the BP-lowering effect of AT is greater in patients receiving medication [24, 25].

257 Finally, an important explanation, as cited before, may be the mathematical approach adopted in the

258 previous studies [13, 14] that considered the same initial BP for calculating both PEH and the BP-

259 lowering effect of AT, which may have caused spurious significant correlations [16, 17].

260 The absence of association (i.e. a null result) between PEH assessed 30 min after a maximal

261 exercise test and the BP-lowering effect of AT might seem an inconsequential finding. However, it may

262 have important clinical impact considering the readiness to generalize the positive previous results

263 obtained in healthy individuals [13, 14] to other populations. Therefore, despite the importance of

264 maximal exercise test to guide AT for hypertensives, the findings of the present study do not support

265 the use of the BP response measured after this test to identify responder and non-responders to AT

266 among treated hypertensives. Therefore, other tools should be identified for this specific purpose. Along

267 this line, in pre-hypertensives, PEH after a submaximal session of aerobic exercise (30 min at 65% of

268 VO_2 peak) has been reported to be associated with the BP-lowering effect of AT [26], however, this

269 relationship needs to be tested in treated hypertensives by future research.

270 Finally, we would like to highlight some of the strengths and limitations of the present study.

271 The assessment of PEH and the BP-lowering effect of AT using different initial BP values reduces the

272 chances for mathematical bias. Additionally, as all patients were under consistent anti-hypertensive

273 treatment for 4 months or more, their clinical condition was stable, reducing any possible influence of

274 medication changes. On the other hand, the results are limited to the study cohort's characteristics.

275 Inactive middle-aged men under antihypertensive treatment were investigated. So, results cannot be

276 generalized to women, physically active patients, other age groups, and untreated patients. These

277 specific populations need to be studied in the future. Additionally, maximal tests were conducted in the

278 morning. As BP presents daily variations, results could be different if tests were conducted at other times

279 of day, which also should be tested in the future. As discussed before, PEH was assessed at 30 min after

280 the maximal exercise test, and future research should test other times points and the association with the

281 greatest PEH. Finally, a lack of statistical power due to a small sample may be a concern. However, the

282 previous studies [13, 14] that revealed strong correlations used samples smaller than the present study

283 (i.e. 12 and 23 subjects) for these calculations. In addition, if the sample size for this study had been

284 calculated *a priori* based on the data of these studies and considering an alpha error of 5% and a power

285 of 90%, the smaller number needed would be 20 subjects.

286   In conclusion, although a maximal exercise test generates PEH and AT decreases clinic and

287 ambulatory BPs in medicated hypertensive men, these acute and chronic BP changes were not

288 correlated. Thus, in this population, BP response assessed 30 min after a maximal exercise test cannot

289 be used to predict the chronic BP-lowering effect of AT.

290

291 **Data Availability Statement**

292   Additional data will be provided by the corresponding author on reasonable request.

293

294 **References**

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385   Aperfeiçoamento Pessoal de Nível Superior–Brasil (CAPES, financial code 001).

386

387   **Ethical Approval**

388   All patients signed a written consent form. The study from which data of the present

389   investigation was derived was approved by the Research Ethical Committee of the School of Physical

390   Education and Sport (no. 966.072) and registered in the Brazilian Clinical Trials platform (RBR-

391   7q7pz7), and its procedures followed the standards proposed by the Helsinki Declaration.

392

393   **Competing Interest**

394   The authors declare no competing interests.

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410   **Figure 1 –** Study Flowchart.

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412   **Figure 2** – Associations between the changes clinic and ambulatorial systolic (SBP), mean

413   (MBP) and diastolic (DBP) blood pressures assessed after a maximal exercise test (Δ after Max

414   test) and after a period of aerobic training (Δ after AT).

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419

Signed the Consent Form
(n=68)

Not eligible (n=32)

15 = Lack of time;
2 = Morning of Evening Chronotype;
4 = BMI $\geq$ 35 kg/m^2;
1 = Thrombosis;
1 = Drugs that alters Heart Rate;
3 = Physically Active;
1 = Congestive heart failure;
2 = BP $\geq$ 160/105 mmHg;
1 = Cardiovascular abnormality;
2 = Personal reasons.

Pre-training screening
maximal exercise test (n=36)

Pre-training Clinic and
Ambulatory Blood Pressure
Evaluation (n=36)

Dropout (n=6)

Post-training Clinic and
Ambulatory Blood Pressure
Evaluation (n=30)

Figure 1 – Study Flowchart.

Column 1 (SBP):
- y = 0,1863x - 3,2105; R² = 0,0278
- y = 0,082x - 1,1217; R² = 0,005
- y = 0,1609x - 0,7496; R² = 0,0146
- y = 0,001x - 0,891; R² = 0,000

Column 2 (MBP):
- y = 0,283x - 2,140; R² = 0,101
- y = 0,212x - 1,682; R² = 0,031
- y = 0,325x - 1,662; R² = 0,049
- y = 0,167x - 0,598; R² = 0,021

Column 3 (DBP):
- y = 0,292x - 1,976; R² = 0,124
- y = 0,322x - 2,013; R² = 0,067
- y = 0,402x - 2,602; R² = 0,065
- y = 0,272x - 1,175; R² = 0,059

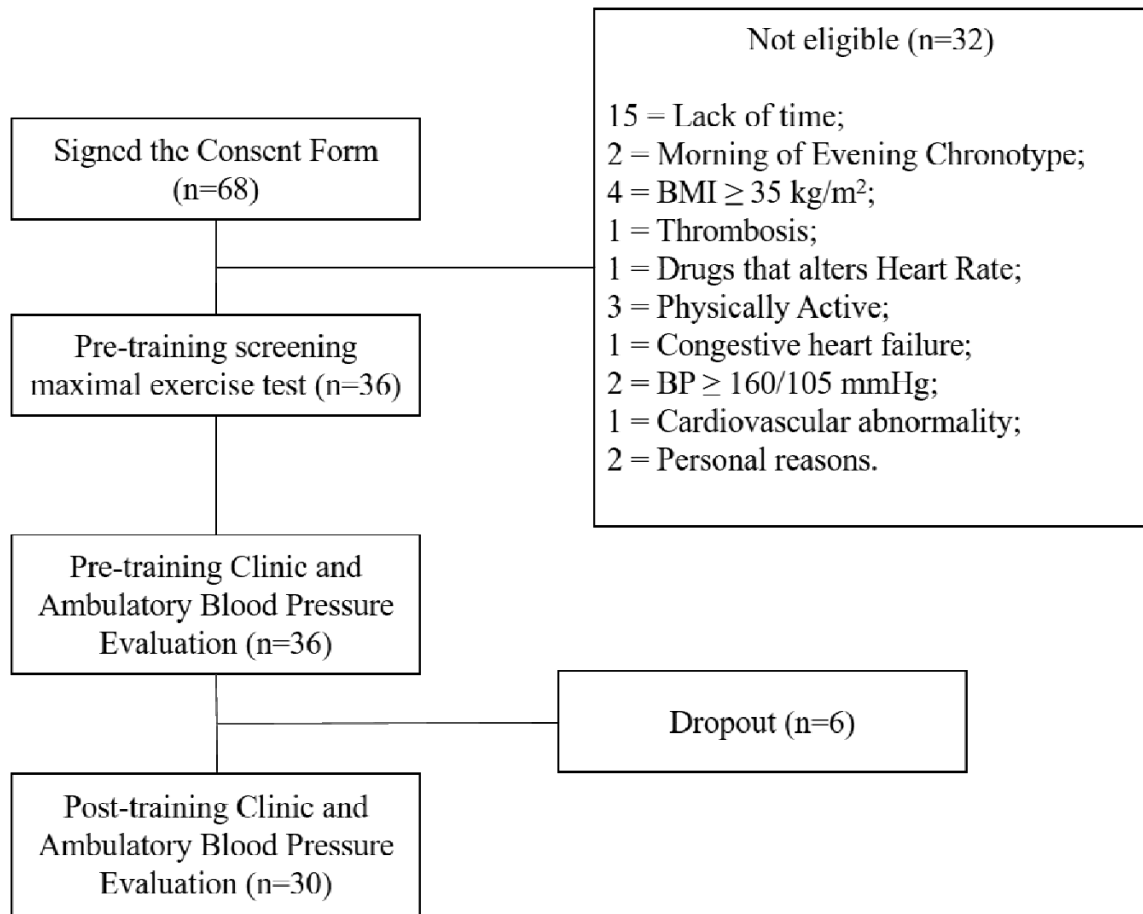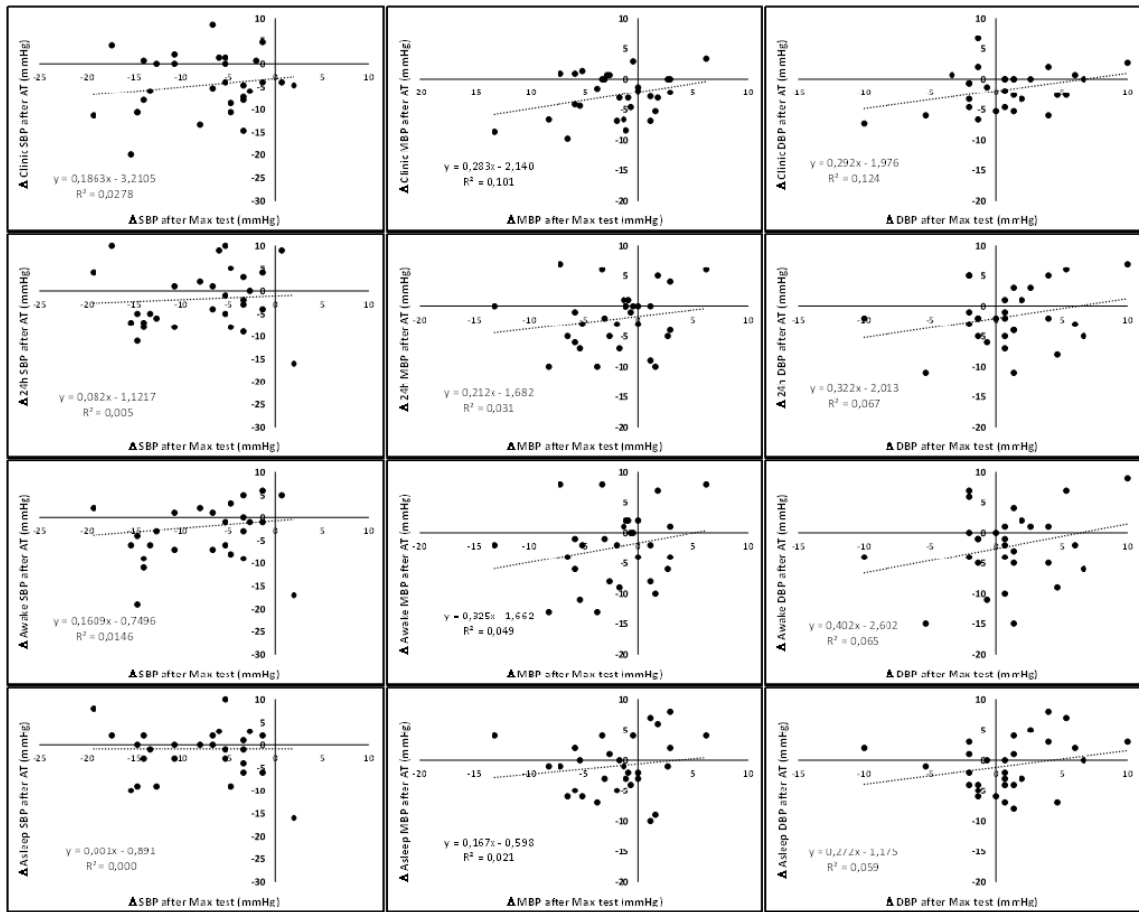**Figure 2 –** Correlations between changes (Δ) in systolic (SBP), diastolic (DBP) and mean (MBP) blood pressures assessed after a maximal exercise test (Max test) and after a period of aerobic training (AT).

Table 1 – Sample characteristics (n = 30).

Characteristic	Mean ± SD
General	
Age (years)	50 ± 8
Body mass index (kg/m^2)	29.9 ± 4.3
Systolic blood pressure (mmHg)	133 ± 7
Diastolic blood pressure (mmHg)	90 ± 6
Antihypertensive Drugs	*n (%)*
Angiotensin II receptor blockers	15 (50)
Angiotensin converting enzyme inhibitors	11 (37)
Dihydropyridine calcium channel blockers	7 (23)
Diuretics	9 (30)
Antihypertensive Strategy	*n (%)*
Monotherapy	21 (70)
Polytherapy	9 (30)

Table 2. Post-exercise hypotension evaluated by systolic, mean, and diastolic blood pressures

(BP) measured before and at 30 min after the maximal exercise test.

	Pre-test	Post-test	P
Systolic BP (mmHg)	131 ± 14	123 ± 15 *	**< 0.01**
Mean BP (mmHg)	104 ± 9	102 ± 10 *	**0.01**
Diastolic BP (mmHg)	90 ± 8	91 ± 8	0.29

* Significantly lower than pre-test

Table 3. Aerobic training blood pressure lowering effect assessed by clinic and ambulatory BPs measured before and after 10 weeks of aerobic training.

	Before training	After training	P
Clinic BP			
Clinic systolic BP (mmHg)	131 ± 12	126 ± 11 †	**< 0.01**
Clinic mean BP (mmHg)	104 ± 8	102 ± 8 †	**< 0.01**
Clinic diastolic BP(mmHg)	91 ± 6	89 ± 6 †	**0.01**
Ambulatory BP			
24h systolic BP (mmHg)	129 ± 9	127 ± 8	0.17
24h mean BP (mmHg)	100 ± 8	97 ± 6 †	**0.03**
24h diastolic BP(mmHg)	85 ± 7	83 ± 6	0.06
Awake systolic BP (mmHg)	134 ± 10	132 ± 7	0.17
Awake mean BP (mmHg)	104 ± 8	102 ± 6 †	**0.05**
Awake diastolic BP(mmHg)	90 ± 8	87 ± 6	0.06
Asleep systolic BP (mmHg)	119 ± 10	118 ± 9	0.45
Asleep mean BP (mmHg)	88 ± 7	88 ± 7	0.29
Asleep diastolic BP (mmHg)	73 ± 7	72 ± 7	0.25

† Significantly different from before training.

Table 4. Correlations between blood pressure change after the maximal exercise test (Δ BP after Max test) and clinic and ambulatory blood pressure changes observed after the aerobic training (Δ BP after AT).

	Δ BP after Max test		Δ BP after AT	n	r	p
Systolic BP (mmHg)	-7.6 ± 5.7	Clinic	-4.6 ± 6.4	30	0.17	0.38
		24 hour	-1.8 ± 6.7	29	0.07	0.72
	-7.8 ± 5.7	Awake	-2.0 ± 7.6	29	0.12	0.53
		Asleep	-0.9 ± 6.4	29	0.00	1.00
Diastolic BP (mmHg)	+0.8 ± 3.8	Clinic	-1.8 ± 3.2	30	0.35	0.06
		24 hour	-1.7 ± 4.8	29	0.26	0.18
	+0.9 ± 3.8	Awake	-2.2 ± 6.0	29	0.25	0.18
		Asleep	-0.9 ± 4.3	29	0.24	0.20
Mean BP (mmHg)	-2.0 ± 4.0	Clinic	-2.7 ± 3.6	30	0.32	0.09
		24 hour	-2.1 ± 4.9	29	0.18	0.36
	-2.0 ± 4.1	Awake	-2.3 ± 6.0	29	0.22	0.25
		Asleep	-0.9 ± 4.6	29	0.15	0.45

Data: Mean ± standard deviation.