RUNNING HEAD: Office Exercise and Fitness —Godfrey et al.

**Running the GAUNTLET at work: The Effect of Short Intense Exercise on Blood Pressure**

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ABSTRACT

High blood pressure leads to an increased risk for heart disease, the number one killer worldwide. Sedentary office workers are looking for quick ways to improve their fitness through the workday; short increases in blood pressure provide a workout for the heart and can lead to lower blood pressure readings overtime. We devised an experiment to determine if short stair-runs increase blood pressure enough to provide a good heart workout. Our results provided some evidence of increased blood pressure from the short workouts, however technical difficulties made the results unreliable. More research is necessary to determine if these short stair-runs work the heart enough to lead to decreased resting blood pressure and increased heart health overtime.

Key Words: blood pressure, office exercise, short exercise routines, fitness, Logger Pro®

INTRODUCTION

Blood pressure is the amount of force or pressure that blood exerts on the walls of heart and blood vessels as it passes through. Three measurements comprise a blood pressure reading. Systolic blood pressure is a measure of blood pressure while the heart is beating and diastolic pressure is a measure of blood pressure while the heart is relaxed, between heartbeats. The mean arterial pressure (MAP) is the average arterial blood pressure during a single cardiac cycle.

High blood pressure affects more than 1/3 of all Americans (CDC 2008). The condition puts extra stress on the cardiovascular system leading to increased risk of heart disease, recognized as the number one killer worldwide (CDC 2008; Mayo Clinic 2010). According to the Centers for Disease Control and Prevention (2008), more than 800,000 Americans die from this silent killer annually, 150,000 of which are under the age of 65 (Rugenski and Whiles 2012).

In the face of these staggering statics, Americas are attempting to squeeze-in quick workouts to increase their fitness and decrease their blood pressure. Individuals stuck in sedentary occupations are doing their best to find small ways to increase their activity level throughout the workday. Evidence has shown that exercise can lead to decreases in blood pressure. Regular physical activity makes your heart stronger. A stronger heart needs to work less to pump and the force on your arteries decreases, lowering your blood pressure. Increased activity can lower your systolic blood pressure — the top number in a blood pressure reading — by an average of 5 to 10mm Hg over time (Mayo Clinic 2010). To produce these desired results, the systolic pressure should increase during or just post-exercise as the cardiovascular system attempts to deliver more oxygen to the working muscles. The diastolic pressure (the lower number) should stay about the same, or decrease slightly, due to the dilated blood vessels within the muscles (CDC 2008; Waehner et al. 2009).

Americas are trying to squeeze in office workouts and using the stairs instead of elevator is one of the most popular recommendations for short office-workouts (CDC 2008; Waehner et al. 2009). The Mayo Clinic (2010) reports that short (10 minute) activities can also produce the desired results of lowering blood pressure. Our objective was to determine if running up and down the stairs produced blood pressure readings consistent with those that would lead to a strengthened heart and decrease resting blood pressure over time. We hypothesized that post-exercise blood pressure readings would show increased systolic pressure and constant or slightly decreasing dystolic pressure, when compared to resting blood pressure readings.

MATERIALS AND METHODS

The materials used in this lab included a computer with Vernier Logger *Pro*® software, Vernier LabQuest Mini® with accompanying USB cable, and a Vernier Blood Pressure sensor.

Additionally, access to stairs from one floor to another are required. We selected two individuals, one male and one female, to participate in the experiment. Participants should be dressed for physical activity, including gym shoes. Each individual, referred to throughout as 001(female) and 002 (male), obtained a reading of their resting blood pressure including systolic, diastolic, and MAP, using the Logger *Pro*® Blood Pressure program in human physiology, 07 Blood Pres Vital Sign.

We wrapped the pressure cuff around the upper arm of each participant while he/she was sitting in a resting position with their arms to their side, on a table, or arm rests. After clicking the green “collect” arrow in the data collection toolbar, we pumped the cuff until a pressure of 150 mm HG was obtained. After which, we pressed the release valve causing the cuff to slowly loose pressure and complete the reading. We saved each reading in Logger *Pro*® and entered into an Excel® worksheet.

After we determined the resting blood pressure of each participant, which served as a control, we measured their blood pressure after short exercise. Each participant ran up four short flights of stairs (between two floors), touched the upstairs door and ran back down. Immediately upon completion a blood pressure reading was obtained while the participant stood, using the same methods as outlined above. We repeated this process three times for each participant, saved each reading in Logger *Pro*® and entered the data into an Excel® worksheet.

RESULTS

The resting blood pressure readings of participants 001 and 002 were similar and within the normal range (140/90 mmHg - 90/60 mmHg) according to Coronary Heart Health (2008) (table 1). The blood pressure of participant 001 was 117/62 with a MAP of 80. The readings for 002 were 123/68 with a MAP of 89. Both participants were within the normal range (140/90 mmHg - 90/60 mmHg), and had normal MAP values between 70 – 110 mmHg (Coronary Heart Health, 2008). The MAP of 001 increased with each run, as did the MAP of 002 (figures 1 & 2). The systolic of 002 decreased after the first run but increased substantially after the second and third runs. The systolic reading for 001 could not be read after run 1 or run three, but showed a large decrease from resting after run 2 (figures 1 & 2). The diastolic pressure of 001 could not be read after the second run but did increase from resting after the first run and again after the third run. The diastolic pressure of 002 increased from resting after run 1, stayed roughly the same after run 2, and increase after run 3 (figures 1 & 2).

DISCUSSION

The general trend in MAP did increase with exercise in both participants, when compared to each participant’s resting MAP, supporting our hypothesis. However, all systolic and diastolic pressure readings for participant 001 could not obtained or were incorrect, and therefore any conclusions based on such measurements should only include those from participant 002. Based solely on the data from 002, the general trend in blood pressure did increase with exercise, supporting our hypothesis. The systolic reading of 002 after run one was the only exception to this trend and the reading was clearly incorrect (20 mmHG).

Although some readings did support our hypothesis, it is not possible to draw legitimate conclusions based on data from a single individual. To increase the legitimacy of conclusions based on this experiment several precautions could be taken in future analyses. All electronic devices should be turned off prior to taking reading and all pressure remaining in the cuff after the last reading should be released before a new reading is taken. If time allows, the experiment should be ongoing for a longer period and include regular measurements of all participants resting blood pressure rate to see if a notable decrease occurs with the mini stair-run exercises over time. Also, if possible, the experiment should include a larger sample size to ensure th effects are repeatable within a larger group.

Due to incorrect readings from the equipment, the effect of short stair-run exercises on blood pressure is still unknown. Further research is needed to determine if these short fast workouts could help sedentary office workers achieve better fitness.

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Table 1. Systolic, diastolic and mean arterial pressure (MAP) blood pressure readings of participants 001 and 002 at rest and after three consecutive stair-runs (Runs 1-3).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | At Rest | Run 1 | Run 2 | Run 3 |
| Reading | 001 | 002 | 001 | 002 | 001 | 002 | 001 | 002 |
| systolic | 117 | 123 | 0 | 46 | 20 | 130 | 0 | 144 |
| diastolic | 62 | 68 | 67 | 78 | 0 | 77 | 92 | 87 |
| mean arterial pressure | 80 | 89 | 81 | 89 | 112 | 100 | 137 | 108 |

Figure 1. Line graphs depicting systolic, diastolic and mean arterial pressure (MAP) blood pressure readings for subject 001 at rest and after each of three consecutive stair-runs.

Figure 2. Line graphs depicting systolic, diastolic and mean arterial pressure (MAP) blood pressure readings for subject 002 at rest and after each of three consecutive stair-runs.

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