Analysis of Basic Fitness Parameters for Females at Workplace

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Abstract

This research analysis focuses on the varying task effects on physiological factors and cognitive response on female subjects. These varying tasks affect heart rate and blood pressure as well as cognitive performance are taken to check the physical and mental at workplace for job allocation. A sample size of 30 female workers has been taken. Their blood pressure and heart rate were checked at 5 different times like at rest, after walking, 10mins after walking, after climbing 3 floors, 10mins after climbing. Immediately after taking these readings a Stroop test was conducted immediately after activity to find the cognitive response time in seconds.

Keywords: Heart Rate • Blood Pressure • Cognitive Response • Age • BMI

Introduction

Workplace exercise (WE) is an intervention with specific physical exercises for workers carried out at the work site, which aims to improve general outcomes, such as Quality of Life and occupational environment, as well as specific outcomes, such as muscle strength and flexibility. Analyses of general outcomes of the workers involve ample constructs, and are generally evaluated by questionnaires. In this way, they depend on the individual perception of each worker, which can overestimate the effects of the intervention to the detriment of the other hand, specific outcomes, such as strength, flexibility, and blood pressure may permanence in the health promotion program of the company. On be quantified with measuring instruments, thus diminishing the bias of the workers’ perception subjectivity and contributing towards the true measure of the intervention.

Health promotion is a key issue of the WHO Health for All policy and it reached conceptual maturity in the Ottawa Charter for Health Promotion. Health promotion, as defined in the Charter, is the process of enabling people to increase control over, and to improve their health. The starting point is thus everyone’s potential to do something to improve or maintain their own health. The settings approach to health promotion is designed to initiate and provide scientific and managerial advice on how to organize and maintain organizational and social changes at a given workplace.

Every employer/worker has to go through some basic physical fitness medical tests in order to qualify his/her working capability at any workplace. These are then analyzed and checked whether the worker is fit for the given job or not. Almost all the industries require female workers to do tasks like sitting at workplace, working at manufacturing unit or doing heavy tasks. Industries like software, automobile, chemical, medical hospitals, educational, building constructions, etc.

Literature Review

ROBERT S. FRASER, et. al. [9] attempts to follow changes in blood pressure induced by exercise, using indirect sphygmomanometer, have yielded conflicting results. In the following study, blood pressure measurements were made at rest (standing), during a standard treadmill work load, and during a six-minute recovery period, using a direct method and a suitably damped recording system. It was found that during exercise systolic pressure rises and that diastolic pressure falls, the net result being very little change in the mean pressure. In some subjects there is a secondary rise in all three items between 10 and 30 seconds after cessation of exercise. Changes in pulse rate during exercise and recovery are also discussed.

Hypertension affects 25% of the world’s population and is considered a risk factor for cardiovascular disorders and other diseases. Elizabeth Corpio-Rivera et al. [4] aim to examine the evidence regarding the acute effect of exercise on blood pressure (BP) using meta-analytic measures. The mean corrected global ES for exercise conditions were -0.56 (-4.80 mmHg) for systolic BP (sBP) and -0.44 (-3.19 mmHg) for diastolic BP (dBP; z ≠ 0 for all; p < 0.05). A significant inverse correlation was found between age and BP ES, body mass index (BMI) and sBP ES, duration of the exercise’s session and sBP ES, and between the number of sets performed in the resistance exercise program and sBP ES (p < 0.05). Regardless of the characteristics of the participants and exercise, there was a reduction in BP in the hours following an exercise session. However, the hypotensive effect was greater when the exercise was performed as a preventive strategy in those physically active and without antihypertensive medication.

C.L.M. Forja, et. al. [1] evaluate the effect of exercise intensity on post-exercise cardiovascular responses, 12 young normotensive subjects performed in a randomized order three cycle ergometer exercise bouts of 45 min at 30, 50 and 80% of VO2peak, and 12 subjects rested for 45 min in a non-exercise control trial. Blood pressure (BP) and heart rate (HR) were measured for 20 min prior to exercise (baseline) and at intervals of 5 to 30 (R5-30), 35 to 60 (R35-60) and 65 to 90 (R65-90) min after exercise. Systolic, mean, and diastolic BP after exercise were significantly lower than baseline, and there was no difference between the three exercise intensities. After exercise at 30% of VO2peak, HR was significantly decreased at R35-60 and R65-90. In contrast, after exercise at 50 and 80% of VO2peak, HR was significantly increased at R5-30 and R35-60, respectively. In conclusion, varying exercise intensity from 30 to 80% of VO2peak in young normotensive humans did not influence the magnitude of post-exercise hypotension. However, in contrast to exercise at 50 and 80% of VO2peak, exercise at 30% of VO2peak decreased post-exercise HR and RP.

Deuk-Ja Oh, et. al. [3] conducted a study to investigate the effects of strenuous exercises on resting heart rate, blood pressure, and maximal oxygen uptake. To achieve this total of 30 subjects were selected, including 15 people who performed continuous regular exercises and 15 people as the control group. The difference of mean change between groups was verified through an independent t-test. As a result, there were significant differences
in resting heart rate, maximal heart rate, maximal systolic blood pressure, and maximal oxygen uptake. However, the maxi-mal systolic blood pressure was found to be an exercise-induced high blood pressure.

Hypertension accelerates brain aging, resulting in cognitive dysfunction with advancing age. Wesley

K. Lefferts, et. al[10] performed a study to compare the effects of acute aerobic exercise on cognitive function in 30 middle-aged hypertensive (HTN) and 30 age, sex, and body mass index (BMI)-matched non-HTN adults. Subjects underwent cognitive testing pre/post 30-min cycling. Behavioral data was analyzed using drift-diffusion modeling to examine underlying components of decision-making. Exercise elicited similar changes in cognitive function in both HTN and non-HTN groups. RT decreased for Flanker and memory recognition tasks and was driven by reductions in post-exercise non-decision time (p<0.05). Diffusion modeling revealed that beneficial acceleration of cognitive processing post-exercise (RT) is driven by changes in non-decision components (encoding/motor response) rather than the decision-making process itself.

OSWALD S. LOWSLEY, et. al. [5] Conducted an experiment upon were all healthy men who were in the habit of exercising regularly. With the exception of a few individuals experimented upon in Group I of Part II, the subjects were young athletes in the midst of a training season. Records were taken at all times of the year, varying from the middle of summer (twenty-mile race) to the dead of winter. Several practices runs (thirteen miles, one hundred yards) and one hard race (ten miles) were made in very cold weather with snow on the ground. The records in Part I was made during exercise on the stationary bicycle. The normal pressures and heart rate for each individual were obtained by averaging a number of readings taken at different times; none of these readings were made within the twenty- four hours preceding a race, in order to avoid the stimulating effect of the excitement attendant upon such contests. Previous works have shown that exaggerated blood pressure response to exercise is a valid risk marker for future hypertension, yet the use of an exercise test as a means of early prediction of hypertension still requires methodological development and confirmation. Nobuyuki Miyai, et. al. [8] undertook this study to determine abnormal ranges of blood pressure responses in relation to heart rate increase during exercise. Also to examine the clinical utility of exercise blood pressure measurement in evaluating individual risk for developing hypertension this study was used. They examined exercise test data from a population-based sample of 1033 non-medicated normotensive men (mean age, 42.9 ± 8.5 years; range, 20 to 59 years). 726 subjects were studied here. Progression to hypertension, defined as a blood pressure of _140/90 mm Hg, was found in 114 subjects (15.4%). Results of this study suggests that an exaggerated blood pressure response to heart rate during exercise is predictive of future hypertension independent of other important risk factors and lend further support to the concept that blood pressure measurement during exercise test is a valuable means of identifying normotensive individuals at high risk for developing hypertension. Activation theory proposes that each person has an optimum level of arousal, one at which performance of a particular task is most efficient; and that changes in arousal level may affect changes in cognitive and behavioral performance. This study suggests that exercise of short duration raises the level of arousal to an optimum and maximum cognitive performance can be achieved, however, exercise of long duration raises arousal beyond the optimum to an excited level and cognitive performance decreases. The present study by DIANE H. CRAFT [7] investigated whether the inverted-U relationship occurs with young boys, instead of adults, who are tested individually using prior exercise with precise regulation of the work loads and duration of exercise. The study also investigated whether hyperactive boys’ maximum cognitive performance occurs after a shorter duration of exercise than required for normal children, consistent with the hypothesis that hyperactive children are over aroused and after a longer duration of exercise indicating under arousal. The effects of physical work (30% of VO, max), sleep loss (3-h nap during a 48-h operation), continuous work (CW), and time of day on cognitive performance were assessed (by ANOVA) in this repeated- measures study comparing two groups (exercise/no exercise) of healthy young men (N = 22). This study was performed by CARL E. ENGLUND, et. al. [2]. Treadmill walking did not accentuate or attenuate sleep-loss effects on performance; however, sleep loss alone did degrade visual vigilance and memory for words. Time-of-day fluctuations were found in choice reaction time, logical reasoning, and word memory. The findings indicate that exercise at 30% evo, max does not compound sleep-loss effects in cognitive performance. Indeed, physical activity during video terminal monitoring may delay any sleep-loss decrement. Variability of many cognitive abilities throughout the day appeared to show a greater effect than the sleep-loss and exercise effects over 2 days. Physical inactivity and low resting heart rate variability (HRV) are associated with increased coronary heart disease incidence. Kirsten L. Rennie, et. al. [6] performed five minute recordings of heart rate and HRV measures from 3,328 participants. Calculated was time domain (standard deviation of NN Intervals) and high-frequency-power measures as indicators of cardiac parasympathetic activity and low-frequency power of parasympathetic-sympathetic balance. Moderate and vigorous physical activities were associated with higher HRV and lower heart rate. For men, linear trends of higher low- frequency power with increasing quartile of vigorous activity and lower heart rate with increasing quartile of moderate activity were found. For men whose body mass index was >25 kg/m², vigorous activity was associated with HRV levels similar to those for normal-weight men who engaged in no vigorous activity. Vigorous activity was associated with higher HRV, representing a possible mechanism by which physical activity reduces coronary heart disease risk.

Methodology

The subjects were first asked to take rest and recover from any previous activity performed, the blood pressure (systolic and diastolic) and heart rate readings were taken. At this condition, the participants were given a Stroop test, were they had to identify 5 different colors (green, red, brown, purple and blue) and the time required for finding of each color was taken. Then, the participants were asked to walk at their own normal pace for about 500 meters, and immediately after the readings for heart rate, blood pressure and cognitive test were taken. Participants rested for a while (10 mins) and their heart rate and blood pressure was evaluated. The similar above steps (3 and 4) were done in case of climbing stairs activity.

Data Collection: 30 female subjects of varying ages and varying profession were taken for the experiment. The age group ranged from 21 years to 50 years (general working class). The data collected was the normal heart rate (bpm), blood pressure (mmHg) and cognitive ability. These different readings were taken. At this condition, the participants were given a Stroop test, were they had to identify 5 different colors (green, red, brown, purple and blue) and the time required for finding of each color was taken. Then, the participants were asked to walk at their own normal pace for about 500 meters, and immediately after the readings for heart rate, blood pressure and cognitive test were taken. Participants rested for a while (10 mins) and their heart rate and blood pressure was evaluated. The similar above steps (3 and 4) were done in case of climbing stairs activity.

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Analyze the Data

From the various graphs computed from relation between

- Age with-Cognitive Heart rate Blood pressure
- BMI with Cognitive Heart rate Blood pressure

Interpret and Report: From the above graphs the following interpretations were drawn

Case 1: Variation in heart rate with increase in age
- Effect of walking on heart rate with age (Figure 3).
- Effect of climbing on heart rate (Figure 4).

Case 2: Variation in blood pressure with increase in age.
- Effect of walking on systolic B.P. (Figure 5).
Figure 1. Sample Data.

Table 1. Sample Data.

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Occupation</th>
<th>Address</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>BMI</th>
<th>Health profile (age)</th>
</tr>
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<tbody>
<tr>
<td>John</td>
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<td>Student</td>
<td>School</td>
<td>170</td>
<td>65</td>
<td>20</td>
<td>Healthy</td>
</tr>
<tr>
<td>Jane</td>
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<td>Engineer</td>
<td>Office</td>
<td>160</td>
<td>58</td>
<td>22</td>
<td>Overweight</td>
</tr>
<tr>
<td>Tom</td>
<td>35</td>
<td>Doctor</td>
<td>Hospital</td>
<td>180</td>
<td>80</td>
<td>28</td>
<td>Obese</td>
</tr>
</tbody>
</table>

Figure 2. Sample Data-2.

Figure 3. Effect of walking on heart rate with age.
• Effect of climbing on systolic blood Pressure. (Figure 6).
• Case 3: Variation in Heart rate with increase in BMI.
• Effect of Walking on heart rate. (Figure 7).
• Effect of climbing on heart rate. (Figure 8).

Case 4: Variation in blood pressure with increase in BMI.
• Effect of Walking on systolic B.P (Figure 9).
• Effect of climbing on systolic B.P (Figure 10).

Results

From all the above variation graphs, it has been clearly seen that it takes 10 or more minute for an individual to get back to their normal rate. Also, for light as well as slightly heavy activity like stairs climbing, heart rate and systolic blood pressure does not go beyond the normal range of 80bpm-120bpm and 120mm/Hg-160mm/Hg.

Conclusion

From the data analyzed it is seen that within 10mins of recovery time, heart rate becomes almost normal whereas the blood pressure after walking comes almost to normal, however 10mins after staircase climbing systolic B.P. still remains at higher value. The faster the heart rate and blood pressure comes back to normal, the fitter the person is. The cognitive performance of the subjects were found to be increased i.e. less time was needed post activity i.e. more blood flows to the brain and it performs well. We hence conclude that at any workplace to ensure proper work allocation to the worker, their physiological factors must be taken into consideration. The data we collected helps in finding the fitness level of an individual, which helps allocating...
appropriate job to the individual. This type of test are mostly carried in for females as their muscle strength is lesser than that of men, so they must be allocated with jobs according to their fitness.

References


5. Hopkins J, on and lowsley S. (1911).


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