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Comparative Study on the Heart Rate and Blood Pressure of Debre Markose University 3rd Year Nursing and Sport Science Female Students During Rest and Exercise

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Abstract
The aim of this study is to determine the association of heart rate (HR) and blood pressure (BP) between Debre Markos University sport science and nursing students at rest time and during exercise. For this study, 40 healthy and volunteer female students were used as the sample of this study from the total of 70 3rd year nursing and sport science female students. HR and BP was recorded both during rest and exercise after training during step test. In this study, 40.5 cm height steeper, box or bench was used for step test. The duration of the training for step-test exercise was 3-minutes. The investigation was on the parameters of HR, BP, syastolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and recovery HR. The data was analyzed by using simple descriptive analysis. The finding suggested that there is a significant difference in HR and BP in female sport science students both during rest and exercise after training than healthy nursing female students. So, generally as compared to nursing students, sport science students HR and BP had shown a significant difference during rest and exercise.
Keywords: Blood pressure; Exercise; Heart rate
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1. Introduction

There are so many physiological factors that differs one individual from the other. Among those factors heart rate and blood pressure are usual. Heart rate is the speed of the heart per minute. It measured by an instrument known as stethoscope. The heart rate (pulse rate) can vary according to the body's physical needs including the need to absorb oxygen and execrate carbon dioxide. The normal resting heart rate of an adult human ranges from 60 beats per minute up to 100 beats per minute.

According to (Ottof *et al*, 2110), the increase in heart rate after physical exercise is due to an enhanced sympathetic drive. During mild to moderate exercise due to skeletal muscle vasodilatation pressure (Lippincott Willions and Wilkins, 2007).

A normal response in an apparently healthy subject is a linear increase in systolic blood pressure as exercise intensity increases. This rise in systolic blood pressure with increasing dynamic work is a result of increase in cardiac output (Fletcher *GF et al*, 2001). Cardiac output increase during exercise is a function of heart rate and stroke volume during exercise, an increase in sympathetic activity leads to an increase of heart rate, stroke volume and myocardial contractility to satisfy energy demands of working muscle (Javorkam *et al*, 2002).

Blood pressure values were higher before training compared to after training. An Increase in systolic blood pressure and reduction in diastolic blood pressure observed in both before and after training (becker et al, 2007).

Resting heart rate below 60 bet per minute is known as bradycardia. On the other hand resting heart rate above 100 bit per minute is known as tachycardia. (http://www.craven6e.com). Blood pressure is the force exerted by the blood up on the wall of blood vessels or the chambers of the heart. It measured by sphygmomanometer. The reading of the sphygmomanometer gives two numbers; the first number reading is systolic blood pressure. The second reading indicates diastolic blood pressure. Systole blood pressure is the blood pressure measured during ventricular contraction. The other one is diastolic blood pressure which occurs during ventricle relaxation. It is the lowest blood pressure within ventricular system. (http://www.craven6e.com).

The normal blood pressure for normal individual should be around 120/80. Always, systolic blood pressure written first and then diastolic blood pressure respectively. During vigorous exercise systolic and diastolic blood pressure rises. Because, during this time the heart work harder to pump more blood with each contraction to keep your muscle supplied with oxygen.

Generally, this study was concerned about comparative study on 3rd year Nursing and sport science female students. The two groups may have significantly different resting and exercising heart rate and blood pressure response.

Objectives

- To examine the HR and BP of 3rd year nursing and sport science female students at rest time.
- To investigate the HR and BP of 3rd year nursing and sport science female students after exercise.

- To compare HR and BP of the two group with standards.

2. Methodology

This study was conducted in Deber Markos University on 3rd year female sport science and nursing students. In this study only post-test experimental design was used and it was done by using primary source of data (filed test). The sampling technique of this study was simple random sampling technique of 3rd year nursing and sport science female students. By distributing physical readiness questionnaire 40 volunteer and healthy female students was selected from the total of 70 female students. Then, based on the criteria students who full fill the inclusion criteria were selected. But, other students who did not fulfill the inclusion criteria and non-volunteer students were excluded from the sample by using specific code. The student's lifestyle and health status was chalked by physical readiness questionnaire. All students measured their resting heart rate, resting blood pressure, exercise heart rate and exercise blood pressure by using the following instruments and materials

2.1 Data collection instruments and materials

For this study the following instruments and materials was used to collect data wisely.

- Army-type fully automatic digital blood pressure and heart rate monitor, model PB-1304:- to measure BP and HR
- Notebook & pencil:- To record the data
- Steeper (box):- To perform 3-minutes step test exercise.

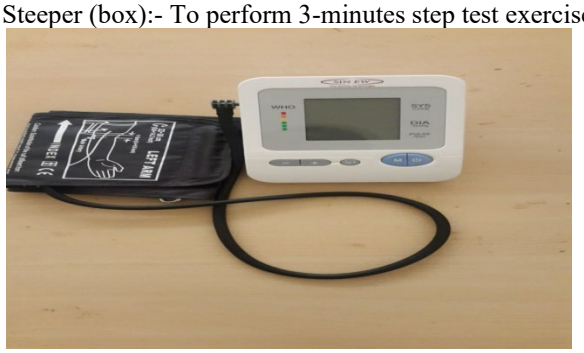

Figure 1:Arm-type fully automatic digital blood pressure monitor

2.2 Measuring Protocols

Individuals or subjects of this study was selected from two group. That are from nursing and sport science students. So, the experiment was done on these two groups. The general testing guidelines were:

- Avoid eating, exercising, and bathing for 30 minutes prior to testing
- Sit in a calm environment for at least 5 minutes prior to testing
- Do not stand while testing. Sit in relax position while keeping your arm level with your heart
- Avoid speaking or moving body parts while testing
- While testing, avoid strong electromagnetic interference such as microwave ovens and cell phones
- Wait 3 minutes or longer before re-testing
- Try to measure your blood pressure at the same time each day for consistency
- Test comparison should only be made when monitor is used on the same arm, in the same position and at the same time of day
- The measurement is not recommended for people with sever arrhythmia

2.3 Protocols to measure RBP and RHR on the left arm

According to (Lippincott Williams & Wilkins, 2008) for this measurement should be apply the following procedures;

1. Assist client to comfortable position with fore arm supported at the heart level and palm up.
2. The upper arm was exposed completely. Because, accurate placement of cuff requires complete exposure of upper arm.
3. The cuff was placed directly over brachial artery.
4. The cuff was deflated and waited one to two minutes. Because, awaited period prevents falsely high readings, by allowing blood trapped in the vein to recalculate.
5. Identify the oscillometerir reading. That is indicating SBP, DBP and HRrespectively.
6. Record measures of SBP, DBP and HR
7. Wait on full minute before redoing the BP and HR measurement you need to average to least two BP and HR reading to get "a true sense" of an individual BP and HR.

Then, will be written as systolic over diastolic (SBP/DBP) and abbreviate "LA" to indicate left arm measurement. The scoring placed in mmHg (Millimeter mercury).

Figure 2: Measuring BP and HR by using arm-type fully automatic digital blood pressure monitor.

2.4 Protocols to measure exercise BP and HR

According to (Lippincott Williams & Wilkins, 2008) to measure the exercise blood pressure is not dissimilar to that used for resting BP- measurement, but, there is some specific suggestions are needed those are;

1. Secure the BP cuff to your clients arm before exercising; tape the cuff to the arm with adhesive surgical tope to keep the cuff in place.
2. You should eliminate movement of the cuff by being extra careful in their placement and by holding the arm type fully automatic digital blood pressure. You should try to have your client relax the arm during measurement.
3. Make sure to the cuff up higher than you would for a resting measurement; 180 to 200mm Hg is a reasonable saturating point.
4. Use an army-type fully automatic digital blood pressure and heart rate monitor for the measurement of BP and HR during exercise and rest.

2.5 Exercise protocols for 3 minute step-test

In this study exercise protocol's are used because, exercise HR and BP of the subjects was measured based on this protocols . Aerobic exercise was used. So, to perform this exercise specific procedures was needed. According to (Thomas D. Fahey, 2001): Demonstrate the subjects about how to perform the 3-minute step-test by stepping up and down on the step keeping time with the beat of the manometer. The exercise was started with worming up and continued for 3-minute step-test by standing the step. The procedure should be in the following meaner; so,

1. Worm up before taking the test.
2. Set the metronome properly
3. Begin the test and continue to step at the correct place for 3-minu
4. Stop after 3-minutes, remain standing and count your pulse for the 15 second period from 5 to 10 second in to recovery.
5. 15 second pulse count
6. Cool down after the test by walking slowly for several minutes.

The purpose of this test is assessing the fitness level of each subjects based on how quickly you are, the quicker your HR was return to normal after exercise. Scoring depends on the age adjusted standards guideline. This test should be selected based on the exercise simplicity and cost. But not due to its accuracy If your facility has the ability to perform sophisticated sub maximal evaluations of cardio vascular fitness, this is advised.

Equipment needed:- stop watch or clock with a second hand; a friend to help you keep count; a 12-inch (40.5cm) height bench, box or steer. Generally, this test indicates the fitness level of each subjects based on how quickly you are, the quicker your HR should return to normal after exercise.

3. Results

Include major findings with tables and analysis

The overall results of this study have shown that 84% of sport science female students were categorized under normal SBP standard level during rest time. Most of nursing female students RHR and RBP were significantly

higher than sport science students. 80% of nursing students were categorized under high MAP level during exercise. Most of sport science female students were categorized under normal MAP level during exercise. During exercise HR and BP of nursing students were extremely increase. The HR and BP of sport science students were increase in some extent during exercise. Generally, the resultindicted the difference in HR, and BP during rest and exercise between female nursing and sport science students.

Table -1: HR and BP response during rest time for 3rd year sport science female students

No	Characteristics		Categories	Results		
				Standards	Frequency	percentage
1	HR response during rest time for sport science female students		Athlete	54-60bpm	9	36%
			Excellent	61-65bpm	6	24%
			Good	66-69bpm	2	8%
			Above avg.	70-73bpm	5	20%
			Average	74-78bpm	2	8%
			Below avg.	78-84bpm	1	4%
			Total	-	25	100%
2	BP response during res time for sport science female students	SBP	Normal	Below 120 mmHg	21	84%
			Pre-hypertension	120-139 mmHg	4	16%
			Total	-	25	100%
		DBP	Normal	Below 80 mmHg	17	68%
			Pre-hypertension	80-89mmHg	8	32%
			Total	-	25	100%

Source-through measurement test

Based on the above table the results reportedthat 9(36%) of sport science female students result were categorized under athlete by their RHR.

Whereas 6(24%) of subjects resulted excellent, 2 (8%) average, 2 (8%) good, 5(20%) above average standard and 2(8%) average RHR and the remaining 1(4%) of sport science female students were resulted below average RHR standard. So, this result indicates that most of sport science female students were free from different heart related risk factors.

Regarding to blood pressure of the respondents show that 21(84%) of sport science female students were normal systolic blood presser 4(16%) of the remaining were categorized under pre-hypertension stage by their level of SBP. On the other hand, 17(68%) of sport science female students were found under normal level of DBP. However, 8 (32%) of the remaining subjects result were under pre-hypertension stage by their level of DBP.

So, this result indicates that most of female sport science students were categorized under normal level of blood pressure, that is both their systolic and diastolic BP of those group were found at normal standard level.

Table-2: HR and BP response during rest time for 3rd year nursing female students.

No	Characteristics		Categories	Results		
				Standards	Frequency	percentage
1	HR response during rest time for nursing female students		Athlete	54-60bpm	-	-
			Excellent	61-66bpm	2	13.3%
			Good	66-69bpm	3	20%
			Above avg.	70-73bpm	2	13.3%
			Average	74-78bpm	2	13.3%
			Below avg.	78-84bpm	3	20%
			Poor	85^{+}bpm	3	20%
			Total	-	15	100%
2	BP response during rest time for nursing female student	SBP	Normal	Below 120 mm	9	60%
			Pre-hypertension	120-139	3	20%
			Stage1 hypertension	140-159	3	20%
			Total	-	15	100%
		DBP	Normal	Below 80	9	60%
			Per-hypertension	80-89 mmHg	6	40%
			Total	-	15	100%

Source-through measurements test

According to table 2; 2 (13.3%) of nursing female students were excellent RHR. 3(20%) of subjects also a good RHR. Whereas 2 (13.3%) of were above average, 2(13.3%) of subjects were categorized under average standard, 3(20%) below average. The remaining 3(20%) female nursing students (were poor RHR.) So, this result simply indicates that most of nursing female students were may exposed for different heart related risk factors.

According to table2, 9(60%) of female nursing students result were under normal SBP.

3(20%) of the subjects result were categorized under pre-hypertension 5BP, where as the remaining 3(20%) of female nursing students were categorized under first stage hyper tension. On the same characteristics and on the same table 2. 9(60%) of female nursing students were also resulted normal DBP. Whereas the remaining 6(40%) of the subjects result were categorized under pre-hypertension DBP. So, this result indicates that most of nursing female students may be exposed for hypertension and other related risk factors.

Table -3: The mean atrial pressure (MAP) level of 3rd year nursing and sport science female students during exercise after training.

No	Characteristics		Results		
			Standard	Frequents	Percentage
1	MAP of sport science female students during exercise	Normal	80-105mmHg	17	68%
		High	Above 105 mm Hg	8	32%
		Low	Below 60 mm Hg	-	-
		Total	-	25	100%
2	MAP of nursing female students during exercise	Normal	80-105mm Hg	3	20%
		High	Above 105 mm Hg	12	80%
		Low	Below 60 mm Hg	-	-
		Total	-	15	100%

Source-through measurements test

According to characteristics 1 (in table 3;) the researcher was calculated the MAP of the two studies group comparatively as follow; 17(68%) of sport science female students were categorized under normal MAP. The remaining 8(32%) of sport science female students were categorized under high level of MAP. So, this result indicates that most of sport science female students were found under normal MAP level. About 3(20%) of nursing female students were categorized under normal MAP level. However, 12 (80%) of Nursing female students were found under high MAP level. So, this result indicates that most of nursing female students were found under high MAP level. The increment of MAP can cause or lead to advanced heart disease, blood clots, heart attacks and stroke.

Based on this result the researcher compare the two group and conclude that sport science female students were more health than nursing female students.

4. Discussion

The comparison of female nursing and sport science students display a significant difference response for HR and BP at rest time and during exercise.Because, female sport science students tends to have a lower HR and BP than nursing students. Much of the differences were happened on resting HR and BP. Resting HR and BP response of sport science female students were significantly differ from female nursing students. Different literatures have shown that resting HR and BP is a strong predictor for both cardiovascular-related and all cause of mortality in health adults. This study was also examined the exercise HR and BP of sport science female students was significantly lower than nursing students within 3- minutes step-test exercise. This studyhave shown a faster recovery HR after 5-minutes in female sport science students compared to nursing students. Recovery HR of females sport science students was significantly higher than nursing students after 5 minutes during exercise.

The current study found that exercising HR and BP of female nursing and sport science students were significantly different. The results of this study have shown that arise in SBP during exercise. In line with this study SBP is mainly due to increase in cardiac output and reflects the level of sympathetic and parasympathetic drive during exercise (Laukkasane JA.et al, 2004). The increase in HR after physical exercise so observed is due to vagal withdrawal and an enhanced sympathetic drive (Otto F, *et al*, 2010). Before training the SBP and DBP both are highly increase during walking and running.

After training SBP and DBP slightly decreased in all subjects.Similar to the current result, Corrigate, et al reported that highly significant increased in SBP & DBP during exercise. This study is limited to a small bout of exercise and is conducted on healthy volunteers. Further studies have to be conducted on similar lines to investigate HR and BP differences on the same gender with large sample size.

Conclusion

After the data was being analyzed, the following conclusions were made. Sport science female students were a significantly differ from nursing students by their resting HR and BP, exercise HR, exercise BP and recovery heart rate response. The outcome of this study have indicated that there was significant difference between nursing and sport science female students in their HR and BPat the same year. The overall results of this study have shown that: Sport science female students were good health condition than nursing students of the same gender regarding to blood pressure and heart rate. Since mostof sport science female students were categorized under normal SBP

standard level during rest time and nursing female students' RHR and RBP were significantly higher than sport science students.

Recommendation

Based on the results of this study the following recommendation were suggested:

- In order to reduce high BP without the use of prescription of medication students should change their own lifestyle.
- Students should enjoy in regular physical activity based on their degree of risk factors, age and life style.
- In order to manage and prevent pre-hypertension students should change their life style.
- Students should be involved at least 150 minutes of moderate intensity cardio vascular exercise per week.
- To lower higher RHR, students should participate in the following type of exercise; such as continuous fast walking; jogging, hiking, cycling, swimming and tennis. But the student should mind that the above type of exercise done according to individual's health status or degree of risk.

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