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CARDIOVASCULAR RESPONSE TO VERBAL COMMUNICATION –
A STUDY IN BUSINESS PROCESS OUTSOURCING EMPLOYEES¹Divya .P²Veena K. N

ABSTRACT

Background: Cardiovascular changes to daily activity and stressors have been proposed as a mechanism for promoting the progression of atherosclerosis and coronary heart diseases. Hence, purpose of the study with objective is to assess the cardiovascular parameters such as heart rate, blood pressure and rating of perceived exertion responses to verbal communication in Business process outsourcing (BPO) employees.

Method: A cross sectional survey design, selected 150 healthy subjects between age group of 25 to 35 years from BPO industry, Bangalore. Subjects who fulfilled inclusion criteria were included into the study. Heart rate and blood pressure were recorded before and after shift. The Borg rating of perceived exertion scale was also administered to find the difference of amount of exertion, which was felt by subjects before and after shift.

Results: The analysis of measured variable shown that before shift the means Heart rate was 81.76 beats, the mean systolic blood pressure is 117.82 the mean diastolic blood pressure is 80.69 and the mean rate of perceived exertion is 7.19. After shift the means of Heart rate was 83.02 beats, the mean systolic blood pressure is 120.32 the mean diastolic blood pressure is 83.26 and the mean rate of perceived exertion is 10.65. When analysed using paired t test there is a statistically significant difference in before and after shift means of heart rate, blood pressure and rate of perceived exertion.

Conclusion: It was concluded that in BPO employees in response to their verbal communication there was significant increase in cardiovascular responses including Heart Rate, Systolic Blood Pressure and Diastolic Blood Pressure. There was also a significant increase in Borg rating of perceived exertion before and after shift

Key words: Verbal communication, BPO employees, cardiovascular response, perceived exertion, Heart rate, blood pressure, stress.

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INTRODUCTION

Stress is a state of affair involving demand on physical and mental energy. It is a condition or circumstance, which can disturb the normal physical and mental health of an individual.¹ Stress at work is relatively new phenomenon of modern lifestyle. Stress due to speech is a result of speech produced under emotional stress, fatigue, heavy work pressure, environmental noises.¹

Business process outsourcing (BPO) is one that is picking up pace fast in India. Effective communication or verbalization is essential for BPO employees at work place because they make calls to specified destination with pre-approved database from their clients. During a shift, the employees have to attend calls non-stop for the time and work with pleasant communications even under stressful situations. For a BPO employee health hazard starts with stress and insomnia and they reported overall high level stress during work. This stress leads to physical problems and emotional distress for employees, which ultimately hampers quality of work performance.²

The studies have found that verbalization is known to increase blood pressure and heart rate in individual with cardiac sysfunctions.³ Significant positive correlations exists in adults between baseline pressure and magnitude of increase during speech with higher resting pressures associated with greater increases while speaking^{4,5} is of clinical importance.

Blood pressure is one measure that effect due to stress. It is a multifactorial and is affected by interaction of genetics, physiological responses to environment and lifestyle factors that have increasing influences as one ages. It is also known to vary according to the varying hours of the day. But studies have shown that emotional and psychological disturbances; due to acute or chronic causes of stress precipitate high Blood pressure in Human beings.⁶

Hypertension is the most prevalent cardiovascular disease today. At least one of seven living Americans are diagnosed as hypertensive with in his/her lifetime.⁶⁻⁹ By using a recently available computerized monitoring system the results obtained was that the simple act of speaking or reading aloud produces rapid and significant elevation in Blood pressure in both hypertensive and normotensive persons.¹⁰⁻¹²

Extreme Cardiovascular reactivity to daily activity and stressors has been proposed as a mechanism for promoting the progression of atherosclerosis and Coronary heart diseases. Verbalization, either

talking or reading aloud, is known to cause significant increase in blood pressure and heart rate of individuals, including cardiac patients.¹³ In adults, the magnitude of pressure increases is directly linked to rate of reading, with more rapid reading thus producing greater hemodynamic changes that produces greater changes.

Studies have found the significant increase in cardiovascular responses such as heart rate, blood pressure and Rating of perceived exertion to verbal communication stresses in both subjects with coronary-prone and non coronary-prone patients,¹⁴ New York City traffic agents,¹⁵ in school teachers^{16, 17}, and in subjects with real-life stressors in 6 min oral presentation during Public Speaking.¹⁸

As there are no studies found on cardiovascular response to Verbal communication in BPO employees, the present study with a research question whether the cardiovascular parameters response are affected by verbal communication in BPO employees. Hence, purpose of the study with objective is to assess the cardiovascular parameters such as heart rate, blood pressure and rating of perceived exertion responses to verbal communication in Business process outsourcing (BPO) employees. It was hypothesised that there will be a significant effect of Verbal communication on heart rate, blood pressure and rating of perceived exertion after shift in the BPO employees.

METHODOLOGY

A cross-sectional survey design. As this study related to human subjects the Ethical Clearance was obtained from the Ethical Committee of M.S. Ramaiah Medical College, Bangalore as per the ethical guidelines for Bio-medical research on human subjects. This topic for subject for dissertation was registered under Rajiv Gandhi University of Health Sciences, Karnataka. Total 150 healthy subjects were selected from various BPO industries, Bangalore. Subjects included were who are working in BPO industry (Voice Support), age group between 25- 35 years, both males and females, working hours for 6 to 8 hrs/day. Subjects excluded were Individual with hypertension or diabetes, Individuals with any lung pathology, risk factors – Smoking, Alcohol. Subjects who meet inclusion criteria were informed about the study and a written informed consent was taken.

Procedure:

The subject who meets inclusion criteria was explained completely about the study. The cardiovascular parameters such as Heart rate, Blood pressure, Borg rating of perceived exertion

was recorded at the beginning of the shift and at the end of the day shift using the digital electronic monitor, the rating of perceived exertion using Borg rating of perceived exertion scale. Measurements was taken in supine and after subject rested for 15 minutes.

Outcome Measurements:

The cardiovascular parameters such as Heart rate, blood pressure and rate of perceived exertion were measured before and after shifts. The heart rate and blood pressure were measured using Digital electronic monitor and rate of perceived exertion was measured Borg rating of perceived exertion scale.^{19, 20}

Statistical Methods

Descriptive statistical analysis was carried out in the present study. Out Come measurements analyzed are presented as mean ± SD. Significance is assessed at 5 % level of significance with p value was set at 0.05 less than this is considered as statistically significant difference. 95% Confidence Interval has been used to find the significance of proportion of study features. Student t test (paired) has been used to find the significance of RPE, HR, SBP and DBP between before and after shift. The Statistical software namely SPSS 11.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

In the present study total 150 Business process outsourcing employees were participated the mean age of the subjects (Table-1) studied was 28.15 years. The analysis of measured variable shown (table-3) that before shift the means Heart rate was

81.76 beats, the mean systolic blood pressure is 117.82 the mean diastolic blood pressure is 80.69 and the mean rate of perceive d exertion is 7.19. After shift the means Heart rate was 83.02 beats, the mean systolic blood pressure is 120.32 the mean diastolic blood pressure is 83.26 and the mean rate of perceive d exertion is 10.65. There is a statistically significant difference in before and after shift means of heart rate, blood pressure and rate of perceived exertion. Data analysis has shown the significant increase in HR with 1.54%, SBP with 2.12%. DBP were 3.18% after shift and Borg rating of perceived exertion scale has shown significant increase of 34.63%.

Table 1: Age distribution of the subjects studied

Age in years	Number	%
25 years	27	18.0
26-30 years	93	62.0
31-36 years	30	20.0
Total	150	100.0
Mean ± SD	28.15 ± 2.66 (25-35)	

Table 2: Gender distribution of the subjects studies

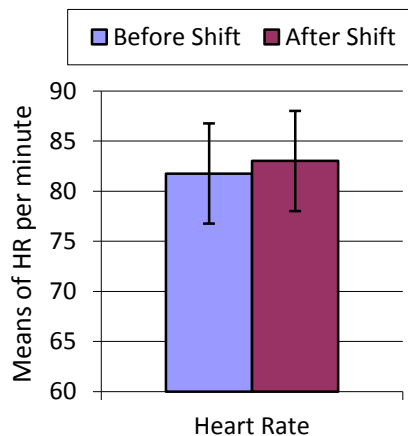
	Number	%
Male	98	65.3
Female	52	34.7
Total	150	100.0

Table 3: Analysis of means of variable measured in subjects studies

	Before shift Mean ±SD	After shift Mean ±SD	Percentage of change	t value	df	Significance P value
Heart rate (beats/min)	81.76 ± 13.33 (54-114)	83.02 ± 14.35 (56-120)	1.54%	1.675	148	p = 0.04**
Systolic Blood pressure in mm/Hg	117.82 ± 12.46 (100-160)	120.32 ± 11.99 (90-162)	2.12%	3.386	148	p < 0.000**
Diastolic Blood pressure in mm/Hg	80.69 ± 9.19 (45-110)	83.26 ± 7.78 (55-100)	3.18%	4.605	148	p < 0.000**
RPE	7.91 ± 2.05 (6-15)	10.65 ± 2.10 (6-17)	34.63%	15.747	148	p < 0.000**

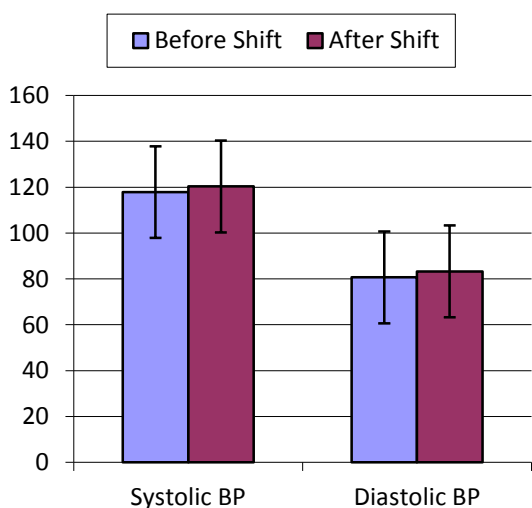
**Statistically significant difference (p < 0.05)

Graph 1: Analysis of means of Heart rate measured in subjects studies



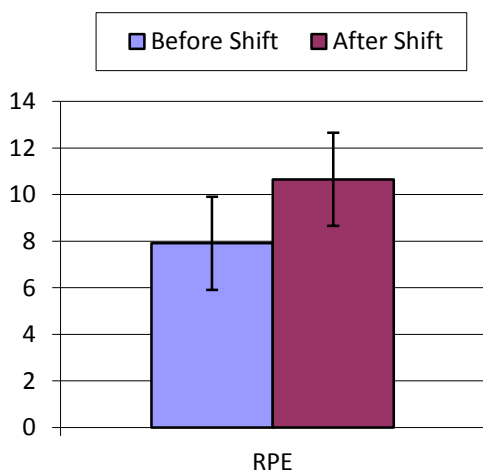
The above graph shows that there is significant increase in Heart rate after shift.

Graph 2: Analysis of means of blood pressure measured in subjects studies



The above graph shows that there is significant increase in Blood pressure after shift.

Graph 3: Analysis of means of RPE measured in subjects studies



The above graph shows that there is significant increase in rate of perceived exertion after shift.

Table 3: Rating of perceived Exertion (RPE) – Before and after shift

RPE	Before shift		After shift	
	n	%	n	%
6	53	35.3	9	6.0
7	26	17.3	3	2.0
8	17	11.3	3	2.0
9	31	20.7	24	16.0
10 & above	23	15.3	111	74.0
Total	150	100.0	150	100.0

Table 4: Heart rate –Before and after shift

Heart rate (beats/min)	Before shift		After shift	
	No	%	No	%
≤70	34	22.6	37	24.7
71-80	34	22.6	27	18.0
81-90	46	30.7	52	34.7
91-100	25	16.7	15	10.0
>100	11	7.3	19	12.7
Total	150	100.0	150	100.0

Table 5: Systolic Blood pressure –Before and after shift

Systolic Blood pressure	Before shift		After shift	
	No	%	No	%
≤120	107	71.3	95	63.3
121-140	36	24.0	48	32.0
>140	7	4.7	7	4.7
Total	150	100.0	150	100.0

Table 6: Diastolic Blood pressure –Before and after shift

Diastolic Blood pressure	Before shift		After shift	
	No	%	No	%
≤80	89	59.3	66	44.0
81-90	47	31.3	63	42.0
91-100	11	7.3	21	14.0
>100	3	2.0	-	-
Total	150	100.0	150	100.0

DISCUSSION

The results in this study shown that verbal communications has a significant effect on increasing heart rate, blood pressure and rate of perceived exertion after shift in BPO employees.

The number of subjects rating the level of perceived exertion in the lower grading of Borg scale was less at the beginning of the shift. After the shift the perceived exertion level reached a higher grading. This increase the rating of perceived exertion could have been due to increase stress as day approaches due to increase demand at work place, work completion and time limitation.²¹

On analyzing the heart rate responses before and after shift, there is significant change in after shift. Before shift most of the subject's heart rate was within normal range and few had heart rate more than 100. After shift the normal range increased slightly but the heart rate more than 100 increased significantly. Initially sympathetic nervous system is stimulated and increases heart rate and blood pressure. When the stress stimuli is continued cortisol is released and Para sympathetic nervous system takes a relatively longer time to get activated, this would have been the reason for increase heart rate after shift.²²

At the beginning of the shift systolic blood pressure was within normal range for maximum people and the range changed to low to moderately risk category that is (120-140 mm of Hg) for many after the shift. Diastolic blood pressure was within normal for about 60% of subjects before shift and the range changed to 81-90 for about 42% and 91-100 for about 14% of subjects after shift. A study published in psycho physiology finds that large rise in blood pressure during mental stress are associated with higher levels of activity in the regions of the brain associated with experiencing negative emotions and generating physiological responses in the rest of the body. The research suggests that exaggerated activity in cingulate cortex during mental stress may generate excessive rise in blood pressure that may place individuals at a greater risk for heart diseases.^{22,23}

It could can be speculated that heart rate - derived variables reflect the control pathway in cardiovascular control mechanism ("central command"), while blood pressure response is more influenced by local conditions in the working muscles that partly mask the effect of changes in mental work load. Central command is a feed forward mechanism that, through signals originating in higher brain centers, activates cardio vascular and somato motor systems. Increase central command resets carotid cardiac (i.e., heart rate) and carotid vasomotor (i.e. blood pressure) stimulus.^{22,23}

Studies have evaluated the cardiovascular and subjective stress responses to a combined physical and mental work load and the effect of rest and in those studies found that stressors induce an increase in blood pressure compared to baseline that persisted and for diastolic blood pressure it even increased in subsequent control sessions.^{14-18, 24.}

In some people, stress induced adverse feelings and anxieties tend to persist and intensify¹. The signs and symptoms of stress are manifestations of the functional adjustments that happen in the body²¹. It varies with the type of stress whether it is acute, chronic, or delayed.

Frequent stress response of our body increases a host of molecules potentially, dangerous for the optimal health of heart. These are low density lipo proteins (LDL). Stress delays the processing and clearance of LDL, their accumulation puts people at risks of developing atherosclerosis or arteriosclerosis and other heart diseases. As response to daily stress, extreme reactors show a high level of Palpitations and blood Pressure in their body.²⁵

Chronic stress can cause an actual decrease in blood flow to the heart. Some cardiologists have documented reduction in blood flow in response to stressful situations.²² The decrease in coronary blood flow that occurs with mental stress can be as great as with physical exertion. Stress in speech is a result of speech produced under emotional stress, fatigue, heavy work pressure, environmental noises.²³ Prolonged physiological activation before and after stressors supports the theories that explain the link between stress and disease, specifically cardiovascular diseases.³

Therefore, the present assessed that the cardiovascular parameters such as heart rate, blood pressure and rating of perceived exertion responses increase to verbal communication in Business process outsourcing (BPO) employees after shifts.

The study is with several limitations. This study failed to check the differences in day and night shift cardiovascular responses as there are diurnal changes in these parameters in normal individuals. Total speaking time in the shift could not be standardized.

Future studies are recommended to check the differences in day and night shifts. Future studies can be done in younger versus middle aged people in BPO industry.

Conclusion

It was concluded that in BPO employees in response to their verbal communication there was significant increase in cardiovascular responses including Heart Rate, Systolic Blood Pressure and Diastolic Blood Pressure. There was also a significant increase in Borg rating of perceived exertion before and after shift.

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Conflicts of interest: None

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