RESEARCH ARTICLE

Deciphering the impact of pet or balloon play as a stress buster for exam-stressed students

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Abstract

Objective: To explore if exam stress affects students by altering their heart rate and blood pressure, and if it varies with age and gender.

Method: The cross-sectional, quasi-experimental study was conducted from January-December 2019 at the Virtual University of Pakistan (Rawalpindi campus). The study included undergraduate students regardless of age, gender and academic year. The participants were divided into animal interaction group R and balloon activity group B, letting the subjects choose between the two activities for releasing stress. Systolic and diastolic blood pressure readings and pulse rates were noted using a digital blood pressure monitor. Data was analysed using SPSS 21.

Results: Of the 186 students with mean age 25.80±5.08 years, 156(83.87%) were females and 30(16.13%) were males. Exam stress significantly increased heart rate as well as systolic and diastolic blood pressure ($p<0.05$). Blood pressure parameters, SBP during exam days and DBP during normal days showed significant correlation with gender, but not with age. The heart rate was not significantly correlated with age and gender.

Conclusion: Both the stress adjustment activities, either patting a pet or playing with a balloon, could significantly reduce exam stress.

Key Words: Stress, Students, Blood Pressure, Heart Rate, Play therapy, Recreational therapy.

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Introduction

In every educational institution, exams serve as a general criterion to assess students' cognitive abilities at the conclusion of a semester or academic year. Stressors that frequently appear in students during studies include worries about grades, relationship issues, isolation, financial difficulties and parental issues.[1] It has previously been documented that the students are extremely susceptible to exam stress, and that both high and low achievers experience feelings of despair and burnout as well as adverse effects on their general health.[2] In a large-scale, multi-site survey conducted in North America in the late 1980s, students reported concern about grades as the most common precursor to depression.[3] In a similar study, it was found that exams were the most common precursor to stress.[1] Many studies have shown that worries about one's grades are one of the main sources of stress for students.[4,5] Throughout a given exam, students may feel varying degrees of anxiety.[6] Stress prior to and throughout exams is a common occurrence for students of all ages, and it can be easily recognised by symptoms like restlessness, indigestion, fatigue, loneliness, aches all over the body, and difficulty recalling material covered in the class.[7]

A slight increase in stress during academic exams can be beneficial if it encourages the student to focus more and make them put in more effort, but a higher spike in stress may lead to undesirable consequences. The importance of stress cannot be overstated since it leads to a sense of achievement and success, and assists them in setting goals for their lives.[8] The stress that occurs during exams affects many students, leading to elevated levels of health issues and dejection in many students from different countries.[9]

Any type of stress is known to cause the body to react mentally and physiologically. The academic exam stress can reduce student's ability to maintain self-control.[10] There is an adverse effect of stress on the immune function of a person undergoing stressful conditions.[11] Under extreme stressful conditions, stress modifies the release of cortisol and the cardiovascular system's reaction.[12] Stress affects the hypothalamic-pituitary-adrenocortical (HPA) axis, and the HPA axis consists of sympathetic actions that affect heart rate (HR), blood pressure (BP), depth of respiration, body balance, temperature and skin resistance.[13]

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BP responses to psychological stress are still a significant predictor of the risk of future illness, especially heart disease.[14] Stress leads to a change in BP and HR.[15] Young medical students experience an increase in BP and HR during the peri-exam period, and the degree of increase in severity is positively correlated with exam anxiety.[16] The way the two genders respond to stress during the examination varies based on their gender.

The current study was planned to examine the effect of examination stress on different physiological variables in undergraduate students, and to check how physiologically the two genders respond to the exam stress.

Subjects and Methods

The cross-sectional, quasi-experimental study was conducted from January-December 2019 at the Virtual University of Pakistan (Rawalpindi campus). The university, a distant learning institution, offers degree programmes to people of all ages, races and social classes so that people working during the day may have access to higher education. Besides, the students can access the lessons for theoretical courses via asynchronous mode, thus supporting online education, whereas university visits are intended for conducting practical classes and to ensure lab-contact hours with hands-on training of science students. After approval from the institutional ethics review committee, the sample was obtained using convenience sampling technique from among those who were visiting the campus for labs and had to appear for exam after a defined number of days. The sample comprised undergraduate students regardless of age, gender and academic year.

The sample size was calculated using the formula as described by Del Águila and González-Ramírez, 2014.[4]

where N = 563, confidence level = 95%, t =1.96 (Z-score), estimated proportion (p) = 0.5, q = 1-p = 0.5, and margin of error (e) = 0.05.

This formula is used to estimate the proportion or prevalence in a finite population. After taking informed consent from the students, they were classified into groups based on their personal preferences between animal interaction group R and balloon activity group B. The students were given a questionnaire to fill out, exploring alterations in their behaviour that they noticed whenever they faced stressful events other than exams. On the exam day, systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured. Afterwards, to calm down the students, they were told to spend some time playing with a balloon or patting a pet (rabbit) to examine the effect of stress-reducing techniques. All the students were in good health and had no major disease. Those who were taking medication for hyper- or hypotension, pregnant women and those who had SBP readings >180mmHg and DBP <60mmHg on a normal classroom day were excluded. All BP and pulse readings were obtained using a digital BP apparatus (Model: Believia Wrist Type BP-40W, BELIEVIA, Germany).

The readings were obtained first on normal classroom days. The readings were recorded again on the exam day before the viva exam. The students were asked to take a rest for about five minutes before BP and HR were recorded. After the exam, the students were asked to enter a quiet room with no disturbance, and they were allowed to spend time with their selected stress-releasing activity for 15 minutes. BP of each student was recorded after this activity.

Data was analysed using SPSS 21. Two-way analysis of variance (ANOVA), descriptive statistics and Pearson's correlation analysis were used as appropriate. Data was presented as mean ± standard deviation, or frequencies and percentages as appropriate. P<0.05 was considered significant.

Results

Of the 186 students with mean age 25.80±5.08 years, 156(83.87%) were female and 30(16.13%) were male. SBP, DBP and HR were significantly higher than on the normal days (Table 1). SBP and DBP values at the third reading were significantly lower than the second reading in both group R (Figure 1, Table 2) and group B (Figure 2, Table 3).

A moderate positive correlation was observed between

Table-1: Mean blood pressure and heart rate during normal and exam days.

	Normal days (mean ± SD)	Exam day (mean ± SD)
SBP	120.9±2.8	132.6±16.7
DBP	77.40±2.1	85.3±12.3
HR	86.6±6.3	97.7±2.3

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HR: Heart rate, SD: Standard deviation.

Table-2: Mean values blood pressure values on the exam day and after playing with the pet.

	Exam day (mean ± SD)	After interaction with Rabbit (mean ± SD)
SBP	137.7±3.5	112.50± 7.07
DBP	85.3±4.24	71.02±7.07

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HR: Heart rate, SD: Standard deviation.

Table-3: Mean blood pressure values on the exam days and after playing with a balloon

	Exam day (mean ± SD)	After interaction with Balloon (mean ± SD)
SBP	137.7±3.5	120.60± 6.36
DBP	85.3±4.24	77.54±3.53

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, SD: Standard deviation.

HR on normal and exam days, suggesting that the individuals having high HR during normal day had tendency to have high HR on exam day as well (Table 4). A positive weak correlation was observed for Normal day HR with exam day SBP and DBP (Table 4), suggesting that individuals having high HR during normal days showed a trend of having high SBP and DBP on exam day. There was also a weak positive correlation between normal day SBP and exam day SBP, and between normal day DBP and

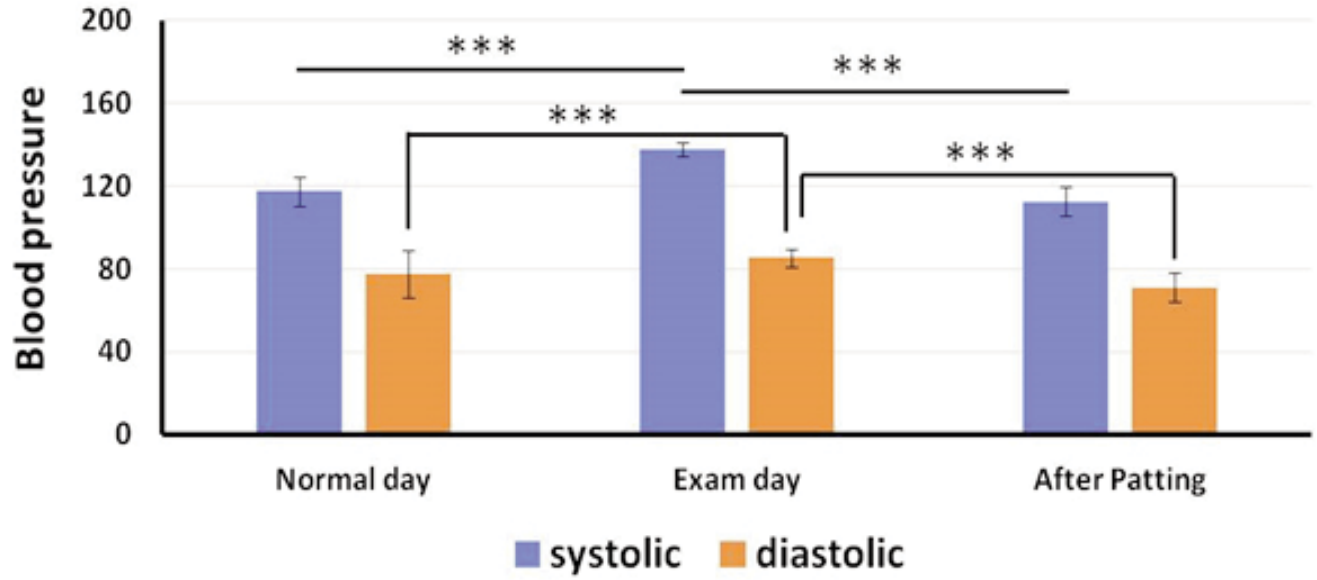

Figure-1: Bar graph plotted between the systolic and diastolic blood pressures measured on a normal classroom day compared to the measurements taken on the exam day before exam was conducted, and after patting the rabbit (pet).

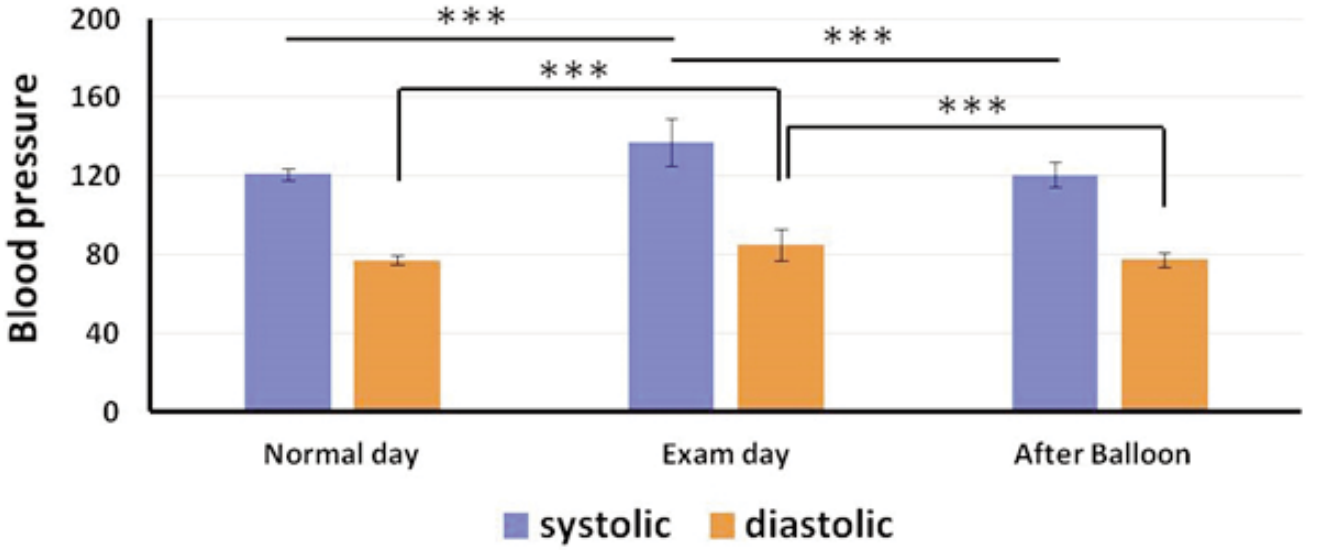

Figure-2: Bar graph plotted between the systolic and diastolic blood pressure values. Readings were obtained on a normal classroom day, on the exam day before conducting the exam, and after playing with the balloon.

Table 4: Correlation analysis.

	HR(normal)	HR(exam)	SBP(exam)	DBP(exam)	SBP(normal)	DBP(normal)	Gender	Age
HR(normal)	1	r=0.357, p=0.000	r=0.061, p=0.412	r=-0.039, p=0.602	r=0.127, p=0.087	r=0.081, p=0.272	r=-0.073, p=0.325	r=-0.071, p=0.338
HR(exam)		1	r=0.137, p=0.063	r=0.021, p=0.777	r=0.162, p=0.028	r=0.055, p=0.457	r=-0.043, p=0.566	r=-0.048, p=0.518
SBP(exam)			1		r=0.272, p=0.000		r=0.286, p=0.000	r=0.059, p=0.428
DBP(exam)				1		r=0.106, p=0.150	r=0.139, p=0.059	r=-0.058, p=0.430
SBP(normal)					1		r=0.285, p=0.000	r=0.118, p=0.110
DBP(normal)						1	r=0.161, p=0.029	r=0.154, p=0.036
Gender							1	
Age								1

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HR: Heart rate.

Table 5: Gender-Based Variation in Blood Pressure (Mean ± SD) with p-values

Condition	Blood Pressure(mmHg)	Female (Mean ± SD) (mmHg)	Male (Mean ± SD) (mmHg)	p-value	Significant or not ($p < 0.05$)
Normal Day	Systolic BP	88.3 ± 10.2	88.8 ± 11.5	0.78	No
Normal Day	DiastolicBP	76.9 ± 8.1	79.8 ± 8.9	0.09	No but trend of males to higher BP
Exam Day	Systolic BP	127.1 ± 14.3	138.9 ± 18.6	0.003	Yes (males have higher BP)
Exam Day	Diastolic BP	85.6 ± 8.5	88.2 ± 9.4	0.04	Yes (males have higher BP)

exam day DBP (Table 4).

There was a weak negative correlation between gender and HR on normal and exam days, meaning no association of gender with heart rate (Table 4). A significant positive association was observed between SBP and gender on normal day and exam day suggesting that SBP values can vary with gender. The male participants had higher higher values of mean systolic and diastolic blood pressure on normal as well as exam days. Similarly, a very weak positive correlation between gender and DBP on exam day, significant positive correlation between gender and DBP on a normal day indicated there was a gender-associated effect on DBP on exam day (Table 4).

A weak negative correlation was observed between age and HR on normal and exam days, and between age and DBP on exam day, suggesting that older students had low HR on both normal and exam days, and there was no significant relation of age and DBP on exam day (Table 4). Similarly, a very weak correlation of age with normal day SBP and DBP was observed, suggesting that SBP and DBP could vary with age, and that older people may have slightly higher BP (Table 4). However, these correlations were not significant ($p>0.5$). The weak positive correlation between age and exam day SBP showed that SBP during the exam was slightly higher in older students, showing a tendency but not significant variation (Table 5).

Discussion

The present study assessed the impact of exam stress on undergraduate students of a distant learning institution on physiological variables, like HR and BP. The effect of stress management activities on the students was also evaluated during the exam. The study also evaluated the relation of different factors, like age and gender, with stress on normal days as well as exam day.

A previous study showed that the exam stress of medical students leads to an increase in BP and HR[16], which is in line with the current findings. As compared to the usual classroom days, exam day witnessed a substantial rise in HRs along with alterations in both SBP and DBP. This aligns with previous research highlighting the physiological effects of stress, including increased HR and BP.[17] Similarly, in another study conducted on 22 medical students, a dramatic increase in both parameters was observed on exam day than on the casual classroom days .[18] In comparison to a study where female medical

students felt significantly more stress than male students[19], the present study found that there was a negligible relation between gender and exam stress.

In a study by Naito et al. in 2020, the effect of exam stress on medical students was checked, and found that both genders experienced significantly higher increases in HR, DBP and SBP, but females experienced higher increases in respiratory frequency in stressful conditions than males.[20] Women typically respond to stress by releasing less adrenaline, and they have lower BP than men, which suggests that the factors influencing women's stress responses may be different from those influencing men's responses.

In the current study, two different stress adjustment activities were used to reduce stress levels as play or recreational therapy immediately after the exam was conducted. One of the groups was supposed to pat the pet, and the other preferred to choose a balloon. Very few studies have been done to find the reduction in stress by these two methods. A pet can be a source of affection, and may bring stability to an emotional state in various situations.[21] Many pet-assisted therapies are used as an integral part of stress management for the treatment of various emotionally disturbed patients.[22] Keeping in view the stress-reducing effect of a pet, one of the current groups of students played with a pet on exam day. The findings suggested that exam stress was significantly reduced after patting for a short period of time. The findings are in line with previous studies.[23-26] Pet interaction lowers HR and BP through the emotional connection and social support that the pets provide.[27-29] In the current study, the students who were reluctant to play with pets were provided with balloons as stress relievers, and similar results were noted. This suggests that any distraction technique could reduce the stress level by lowering the physiological variables.

The current study has certain limitations as it was conducted at a single centre. The participants were predominantly females, thereby leading to an uneven gender balance. Furthermore, the use of self-administered questionnaires could have contributed to biased reporting. Larger, multicentre research comprising diverse populations are recommended to clarify the broader applications of simple, student-oriented strategies for stress reduction in academic settings.

Conclusion

Exam stress prevailed in the students irrespective of curriculum and mode of studies. Both the stress adjustment activities, either patting a pet or playing with a balloon, could significantly reduce exam stress.

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