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Test-Based Stress and Short-Term Risk-Taking Behaviour in older Adolescents

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Abstract- **Previous studies have indicated a correlation between stress and risk-taking in adolescence. Exposure to constant stress can lead to an increase in cardiovascular problems in the long run. This study takes a group of late adolescents (first-year University) and subjects them to the Trier Social Stress Test (TSST) and the Balloon Analogue Risk Test (BART) to observe a correlation between test-based stress and risk-taking. 41 participants, were divided into 2 groups (experimental and control). The test results indicate that the experimental group had higher stress levels (indicated by heart rate) and showed higher short-term risk-taking behaviour (indicated by BART).**

Keywords- **Trier Social Stress Test, Balloon Analogue Risk Test etc.**

I. INTRODUCTION

Previous research has documented a relation between stress, cortisol and risk-taking behaviours among adolescents. For example, Daughter et al., (2013) found that as cortisol levels increased with stress, boys rated higher on the risk-taking tests compared to the girls. Furthermore, a long-term study by Fairchild et al, (2008) showed that adolescents with conduct disorders had a higher level of cortisol that spiked with high stress events. This is consistent with Aiyer et al, (2014) which showed a relationship between prolonged stress increasing cortisol levels and violent tendencies in adolescents; which with an increase in stress, can lead to a rise in hormone levels along with possible long-term behavioural changes.

The neurological changes taking place in the hypothalamic-pituitary-adrenal (HPA) axis of the adolescent brain are key (to monitoring behavioural fluctuations) as it not fully mature and is in the process of development (Chaby et al, 2014). The HPA Axis plays an important role in stress regulation, so naturally during this time of development; there is a significant level of fluctuation of stress in the adolescents. All these studies point towards some common connections that can be sectioned.

- First, adolescence is a time when stress levels in individuals can increase, not only because of the transition to adulthood, but also due to all the physiological changes taking place in the body.
- Second, stress can lead to a variety of disorders, such as anxiety and conduct based disorders.
- Third, many social stress tests (Catherine et al, 2016) can increase the cortisol levels, which can then lead to elevated risk-taking behaviour.

The purpose of the proposed study is to explore the effects of test-based stress on the risk-taking behaviour in late adolescents, particularly, first-year students. First-year students generally go through several changes, including the transition from high school, the growing sense of responsibility as they enter early adulthood, adjusting to the university environment, and the academic rigor of university studies. Previous research has explored the effects of stress on adolescents with respect to gender, age, delinquent behaviour, and so on. In this study, the main focus was the effect of test stress on risk taking behaviour. During term tests and exams, students tend to get stressed which may have adverse effects on their behaviour (i.e. increase risk-taking behaviours). The main objective of the study was to see the effects of test-based stress on risk-taking behaviour patterns in the participants.

The main reason for this is to understand how test-based stress affects the individual's capacity to think rationally. Since, during the first-year of university, a lot of students go through a plethora of stressors. With the addition of constant testing, this can cause some short and long-term effects on the individual's health. A study shows that high levels of psychological stress leads to an increase in risk taking behaviour amongst adolescent males. This was monitored through the fluctuating levels of cortisol (Daughters, et al, 2013). Other studies in point towards adolescent academic stress leading to depression-like symptoms in adulthood (for example, Suchday, et al, 2006). Other studies on rodent adolescent behaviour mimics human adolescent behaviour when it comes to the matter of stress and risk taking and depression (Wilkin, et al, 2012). To target the specific type of stress (test-based) and find out the short-term effects of it on risk taking behaviour, cardiovascular output, and hormone secretion (cortisol), could lead to ways to cope up with the stressors.

II. MATERIALS AND METHODS

Participants were late adolescents; first-year university students with no pre-existing conditions physiological, health or psychological conditions. Initially 49 participants signed-up for the study. At the end, data was analyzed from 41 participants [21 control; 20 experimental]. The other 8 participants did not show up for the study. Participants were split into two groups randomly, the experimental group and the control group. Both groups gave resting heart rates before the start of the experiment. The Trier Social Stress Test (TSST) as well as the control test was administered in Deerfield Hall Room 4021 at UTM. The experimental group was subjected to the TSST, whereas the control group was shown 10-15 min of animal videos (neutral audio-visual stimulus). After that, the procedure for both the groups was similar as they were subjected to the BART and gave the heart rate samples.

1. The TSST – Trier Social Stress Test- The study used a condensed and altered version of the TSST. The participant was told to prepare for an interview for a job. They were given 7 minutes to prepare their interview material. Then, they were taken to another corner of the room (the room was partitioned into sections) for the interview, where the experimenter had the recording equipment set up. The experimenter then instructed the participant that the interview was recorded, (this was the deception part of the experiment as the camera was switched off). After the interview, the experimenter asked the participant to solve a math problem. In this study, the participant was asked to subtract the number 13 from 1996 consecutively for 5 minutes. Every time they made a mistake, they were informed and had to start again. After time ran out, the participant gave their heart rate again.

2. The BART – Balloon Analogue Risk Task- The BART had been used in previous studies to measure the Risk-taking behaviour of adolescents (Lejuez CW et al, 2007). The procedure was simple to understand and follow. The BART is a computer-based risk assessment task. Participants were presented with a balloon that they must blow up for money. The number of pumps determined the amount of money the participant hypothetically received. The balloon had a fixed number of pumps (as its limit) before bursting. The range of pumps varied from 8 pumps to 128 pumps. The participants did not receive any money for balloons that burst. The total number of balloons per trial was 30. The participants will be giving 3 trials of the BART. Final scores were averaged and then tallied with their stress level scores found out by heart rate readings.

3. Pulse- rate recording- The participants pulse rate was measured by the carotid/wrist method. The experimenter measured the pulse rate for 2 minutes. The final number was the average of the two minutes. The participants pulse was measured 3 times during the experiment. Baseline, Post-test, and follow-up.

4. Data collection and processing- The data was collected in an excel file. All the participants were given an experiment number, which was used to record their data. Age was recorded to keep in the range of late-adolescence. The TSST scores were calculated using the participant's pulse rate (experimental group). The BART raw scores were collected in the form of balloon pops and successes, along with the total money earned and the time it took for them to finish a trial. The values for the 3 trials were averaged out to get final calculable data. The data was then calculated using MANOVA and basic descriptive statistics.

III. RESULT

Table 1 the descriptive statistics for both the experimental and the control groups.

Descriptive Statistics

	Mean	Std. Deviation	N
BARTsuccess	16.78048780	3.163691371	41
Bid	45.23	11.447	41
H1	76.22	13.634	41
H2	79.54	14.156	41
H3	78.22	13.133	41
Age	18.66	.990	41

The age of the participants falls under the late adolescent's category. The H2 value is higher than both H1 and H3. The standard deviation for H2 is bigger than the other two groups.

Table 2 Heart rate comparisons for Baseline, Post-test, and Follow-up for the two groups (experimental and control).

4. Group * Time

Measure: Heartrate

Group	Time	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Control	1	76.667	3.011	70.576	82.758
	2	72.952	2.740	67.410	78.495
	3	81.143	2.824	75.431	86.855
Experimental	1	75.750	3.086	69.509	81.991
	2	86.450	2.808	80.770	92.130
	3	75.150	2.894	69.297	81.003

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In the experimental group, we see the value of H2 to be greater (86.450) than in control (72.952). The ranges for values (lower and upper bound) are greater for the experimental group. In the tests for within-subjects effects, the data shows significance for the time and group category (<0.05), indicating significance. The effect size (partial n^2) is .287.

Table 3 Correlation values for the entire study between the two groups (experimental and control).

Correlations

		BARTsuccess	Bid	H1	H2	H3	Age
BARTsuccess	Pearson Correlation	1	-.779**	-.218	-.465**	-.272	-.091
	Sig. (2-tailed)		.000	.171	.002	.085	.571
	N	41	41	41	41	41	41
Bid	Pearson Correlation	-.779**	1	.111	.503**	.027	.121
	Sig. (2-tailed)	.000		.488	.001	.868	.449
	N	41	41	41	41	41	41
H1	Pearson Correlation	-.218	.111	1	.537**	.583**	-.067
	Sig. (2-tailed)	.171	.488		.000	.000	.679
	N	41	41	41	41	41	41
H2	Pearson Correlation	-.465**	.503**	.537**	1	.415**	-.133
	Sig. (2-tailed)	.002	.001	.000		.007	.408
	N	41	41	41	41	41	41
H3	Pearson Correlation	-.272	.027	.583**	.415**	1	-.198
	Sig. (2-tailed)	.085	.868	.000	.007		.215
	N	41	41	41	41	41	41
Age	Pearson Correlation	-.091	.121	-.067	-.133	-.198	1
	Sig. (2-tailed)	.571	.449	.679	.408	.215	
	N	41	41	41	41	41	41

**. Correlation is significant at the 0.01 level (2-tailed).

The values for H2 and the Bids between the groups show significance - 0.001. Bart Success correlation shows significance with the value of 0.002. There is no significance in the age or the resting and final pulse (H1, H3 respectively).

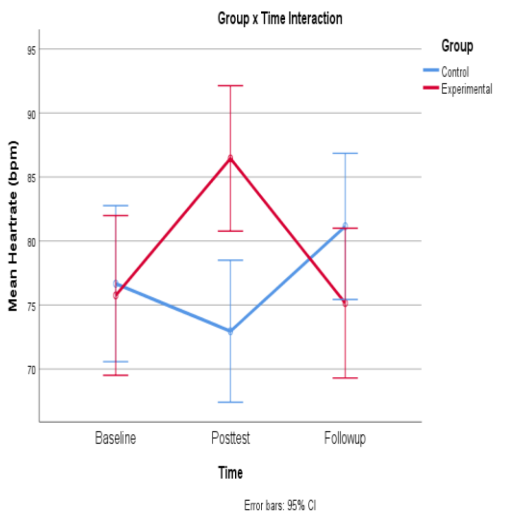

Fig. 1 Correlation between heart-rate and group (experimental vs control), during the experiment.

The spike in heart rate is prominent in the experimental group – from H1 to H2. The drop from H2 to H3 is higher in the experimental group. The control group has a drop-in heart rate from H1 to H2, with a relatively smaller spike from H2 to H3. H3 is higher for the control group than the experimental group.

IV. DISCUSSION

The findings from the results demonstrate a few correlations between the experimental and control group. The first being the correlation between the heart rates during the study and the groups. the mean heart rates of both the groups are similar, which is understandable as it is the baseline pulse rate. The important difference is during the testing phase, where the heart rate for the experimental group gets higher while the heart rate for the control group decreases. The final follow-up heart rates for the two groups are similar, but the difference is greater in the experimental group (11.3) compared to the control group (8.2). The Bid Average scores for the experimental group are higher for the experimental group than the control group, 50.97 and 39.79 respectively. This meant that the participants in the experimental group were making higher bids on average compared to the control group. This indicates higher risk-taking behaviour by the experimental group according to the BART analysis.

The results follow a similar pattern to the previous studies done on risk-taking and stress in adolescents. The increase in stress during a test-based task, like an interview or a mental math test (the experimental group) is easily noticeable by the jump in heart-rate from the baseline to the post-test value. The experimental group also had an increase in risk-taking behaviour, as the group had a higher bid average. The control group had a higher BART success rate, which was indicative of safer bets and moderate risk-taking behaviour. The studies from Fairchild et al., (2008), Daughter et al., (2013), and Aiyer et al., (2014) have similar correlational results for stress and risk-taking behaviour.

The testing sample size for this study have been first-year university students. The results indicate the participants were affected adversely by the stressors and that it did have an effect on their short-term risk-taking behaviour. In the long run, the constant increase in stress, due to course testing, and various interviews; could lead to an increase in baseline heart-rate, which in turn could be detrimental on the individual's cardiovascular health. Since, the sample size represents the students in university, if the results are negative for the experimental group; it would indicate that this problem of increased stress affects a lot more individuals.

The volume of individuals (late-adolescents) then signifies a problem that needs a solution. To get better and more accurate results, it would be advisable for this study to be conducted on a larger scale, and with more biological testing (salivary cortisol) for stress. It would be beneficial to observe the participants over a year, to see changes in baseline pulse-rates and risk-taking behaviour. These alterations could enhance the current study, as the data collected from observation shows a clear correlational significance between the groups. In the future, universities could potentially run this study on a campus-wide basis throughout the undergrad period of a student. The fluctuations in stress levels could help the individual get some help to either reduce their stress levels or manage their activities to prevent an increase. This would help aid the mental health of university students through their late-adolescence period.

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