

**The Influence of Stress Inducing Brain Teasers**

**On Emotions and Snack Preferences**

**Among College Students**

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## TABLE OF CONTENTS

<b>Chapters and Sub-Headings</b>	<b>Page</b>
Acknowledgments.....	1
Abstract.....	2
Introduction.....	3
Literature Review.....	5
The Biological Basis of Stress.....	5
Stress and Eating Behaviours.....	6
Stress and Emotions.....	9
Rationale of the Current Study.....	11
Hypotheses.....	13
Methods.....	15
Participants.....	15
Design.....	15
Materials.....	16
Procedure.....	18
Results.....	20
Descriptive Statistics.....	20
Inferential Statistics.....	24

Discussion.....	29
Interpretation of the Results.....	29
The Strengths of the Present Study.....	33
The Limitations and Weaknesses of the Present Study.....	34
Future Implications.....	35
Conclusions.....	36
References.....	38
Appendices.....	45
Information Sheet.....	46
Safety Questions & Consent Form.....	47
Pre-Positive and Negative Affect Schedule.....	48
Factor 1: Eating and Appraisal Due to Emotions and Stress.....	49
Easy Brain Teasers.....	51
Difficult Brain Teasers.....	52
Post-Positive and Negative Affect Schedule.....	54
Debrief Sheet.....	55

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## ABSTRACT

**Objective:** The main purpose of the study was to investigate the relationship between stress, emotions, and snack preferences among college students. It also aimed to examine differences on unhealthy and healthy snacks as a form of stress reliever. **Methods:** Forty-four participants aged between 20 and 49 were randomly allocated into two conditions. One condition had easy brain teasers while the other had a difficult set. Mood and stress/emotion-related eating questionnaires were administered followed by an offer of healthy and unhealthy snacks. **Results:** Participants in the difficult condition had significantly taken more unhealthy snacks than those in the easy condition. Also, there was a significant difference on the negative mood states before and after the tests were solved. **Conclusion:** People under stress may resort to unhealthy eating as a form of coping strategy. It also showed that stress has a major impact on emotions, particularly on negative affect.

## INTRODUCTION

Health professionals have claimed that living in a healthy lifestyle not only promotes high self-esteem but it is also a necessity for survival. Correspondingly, it reduces the risk of acquiring heart disease, diabetes, and even some forms of cancers. Such lifestyle requires adequate amount of sleep, regular exercise, and a balance diet. For this reason, rigorous campaigns have been established to promote and inform people regarding its enduring benefits. However, there are factors that may affect a person's decision to engage in such behaviour. Factors include the stipulations of the activities of daily living as well as the emotions elicited from meeting these demands. Indeed, stress has a crucial role in altering healthy motives and may have a significant effect on one's understanding of what constitutes a healthy living (Baum & Grunberg, 1991).

Stress has become a part of everyday language as people continue to strive to meet the demands of everyday living. Stress can be acquired through various sources and these could be within the person; the environment and social community; from daily hassles and challenges of work, college, everyday commute; and even family at home. For instance, Banerjee, Bhattacharya, and Sanyal (2014) indicated that chronic headaches associated with personal issues can be a source of stress. Also, exposure to arduous tasks that requires immense cognitive demand can also be a potential stressor (Martin, Lae, & Reece, 2007). In relation to the postulation of Martin et al., (2007), Evans and Stecker (2004) argued that learned helplessness are related to environmental stressors such as noise and overcrowding. They further argued that such stressors are contributing factors to the reduction of task motivation and academic performance. Furthermore, devaluation and discrimination of one's personal beliefs and attributes in a society can evoke negative feelings that may lead to a stressful life (Major & O'Brien, 2005). Additionally, Zafar and Mubashir (2012) stated that a

death in a family particularly a parental figure can also bring forth negative emotions and eventually lead to trauma and distress. In a larger scale, acts of violence (Schuster et al., 2001) and natural disasters (Weems et al., 2007) can be perceived stressful especially if there was a direct involvement to these sudden, unforeseen and unavoidable events. Lazarus (1966) stated that stress arise when individuals recognise that they cannot accordingly acknowledge the demands rendered to them. It can also be a mismatch of one's coping strategies to life's stipulations (Steptoe, 1991). This discrepancy between the demands and the ability to meet them can be considered a threat to their well-being and appraised as taxing.

The sources of stress outlined above are regulated by the person-environment fit (Lazarus & Folkman, as mentioned by Taylor, 2015, p.113) and it can be argued that the definition of stress varies from one person to another but in general it has a negative perception attached to it (Baum, 1990). It can also be suggested that emotions play an important role to this negative perception and may contribute to the development of coping strategies, which include detrimental eating patterns. Moreover, these patterns are aided by direct accessibility and availability of unhealthy snacks.

In spite of the wide range of healthy snacks offered in most shops, alternative unhealthy ones are also on the rise and has become popular in the social mainstream. It can be asserted that the popularity may be due to the fact that they are affordable, readily available, and most of all provide instant gratification. When time is of an essence and pressure builds up, one can rely on unhealthy snacks for the same reasons outlined above and for other rationalisations such as rewarding oneself for dealing problems and prescribing temporary relief. Hence, these foods are commonly referred to as 'comfort foods' (Wagner, Ahlstrom, Redden, Vickers, & Mann, 2014). Resorting to these type of foods may have an enduring ill effect to one's body and also on the appraisal and dealing of stressors.

Researchers from different professional backgrounds have conducted extensive studies on stress and its effects on eating behaviours. Although there were studies that suggest emotions as a key component in the relationship between stress and unhealthy eating, little is known in relation to the changes of one's emotional and mood state when confronted with stressors among students especially in a classroom setting. Correspondingly, it is interesting to investigate if these changes in emotions and mood can influence snack preferences that are available.

## **Literature Review**

**The Biological Basis of Stress.** Response theories have been proposed to explain the physiology of stress. These are the Sympathetic-Adrenal Medulla (SAM) complex, the Hypothalamic-Pituitary-Adrenal (HPA) axis, and the James-Lange theory.

The cerebral cortex, hypothalamus, and adrenal glands comprise the SAM complex. The stressor is identified by the cerebral cortex and this information is transmitted to the hypothalamus, which then triggers a response called as the sympathetic nervous system arousal. This results to the stimulation of the medulla of adrenal glands and hormones such as catecholamines, epinephrine, and norepinephrine will then be secreted. The SAM complex accounts for the feelings of uneasiness accompanied by an increase in heart rate, blood pressure and excessive sweating when confronted by a threat or a stressor (Taylor, 2015, p.116).

On the other hand, the HPA axis is consisted of the hypothalamus, pituitary gland, and the adrenal cortex. The hypothalamus releases a hormone called corticotrophin-releasing hormone (CRH), which stimulates the pituitary gland to secrete adrenocorticotrophic hormone (ACTH). The release of ACTH from the pituitary gland triggers the adrenal cortex



to produce glucocorticoids (Kolb & Wishaw, 2014, p. 600). In non-stressful situations, CRH is released from the hypothalamus in a circadian frequency of two to three episodic secretions (Dallman, Pecoraro, & la Fleur, 2005; Tsigos & Chrousos, 2002). In addition, resting state pulsations of CRH are increased during mornings, which then ensues secretory bursts of ACTH and cortisol in the circulation. As the day goes on, the levels of ACTH secretion decreases. Pinel (2014, p. 469) stated that stress can actuate the HPA axis and the continuous and prolonged actuation relative to a stressful event is detrimental to its normal functioning. Adam and Epel (2007) also stated that the HPA axis is closely related with the endocrine regulation of appetite and the frequent HPA stimulation through the reward pathways may lead to uncontrollable overeating.

Finally, it has been proposed that cognitive appraisals also have significant roles on how people deal with stress. William James and Carl Lange shared the view that emotions are developed through the perception of an appealing or provocative fact and these perceptions cause a collection of physiological responses (Dalglish, 2004; Prinz, 2004). Applying the James-Lange theory in stress and eating behaviours, it can be stated that emotion occurs as a result of bodily responses such as dryness of mouth, increased heart rate, cravings, and hunger. The reduction of cognitive processing due to the upsurge of emotion can lead a person to uncontrollable unhealthy eating.

**Stress and Eating Behaviours.** Extensive studies have been made in stress and its relation to eating behaviours. Kandiah, Yake, Jones, and Meyer (2006) found that there was a significant increase in appetite among college women when stressed. Moreover, sweet foods were the preferred choice by those who were stressed. In contrast, women who were not stressed preferred healthy alternatives. Furthermore, Kandiah, Yake, and Willett (2008) argued that stress can affect a person's eating patterns. They stated that only half of the

faculty participants remained in healthy eating choices under stressful conditions. It was also noted that participants' appetite increased due to stress and they further stated that food was a source of relief and comfort. Both research provided results which indicated stress can alter eating patterns. Similar research conducted by Ng and Jeffery (2003) found that high perception of stress among adult men and women was associated with unhealthy behaviours, which includes consumption of foods high in fat. Their study yielded further support to the concept that high levels of stress is a contributing factor to illnesses and diseases through unhealthy eating behaviours. Furthermore, Conner, Fitter, and Fletcher (1999) investigated whether daily problems of students can influence eating behaviours. By means of diaries as a method of recording hassles and snacks, they found a positive relationship between the two variables. In other words, students who were exposed to hassles on a frequent basis tend to rely more on unhealthy snacks as a form of coping strategy. Steptoe, Lipsey, and Wardle (1998) conducted similar method among nurses and teachers over an eight-week period to assess and compare their daily hassles with their levels of anxiety, depression, and attitude towards eating. Results indicated that consumption of 'fast food' was common on weeks when stress was very high. Comparable research conducted by O'Connor, Jones, Conner, McMillan, and Ferguson (2008) provided strong evidence that daily hassles can affect vegetable consumption and the appetite for main meals due to the increased intake of snacks with high fat and sugar in-between meals. It has also been argued that the terms comfort food and comfort eating is evident in everyday living and is a reflection of the relationship between stress and unhealthy eating (Cartwright, Wardle, Steggle, Simon, Croker, & Jarvis, 2003). They investigated the associations of dietary habits of teenagers on stress. Practices such as consumption of foods rich in fat, number of servings of fruits and vegetables a day, frequency of snacking throughout the day, and how often they eat breakfast were measured using various questionnaires. Results indicated that high stress was associated with increased

consumption of fatty foods and reduced eating of fruits and vegetables. Cartwright et al., (2003) also reported that stress has the tendency to reduce breakfast intake in the morning, which increases the instances of unhealthy snacking throughout the day. Along with self-report studies, effects of stress on eating behaviours were also investigated in laboratory and experimental settings.

In comparison to self-report methods mentioned above, procedures in an experimental setting provide researchers a real-life examination and analysis on the effects of stress towards health. For instance, Oliver, Wardle, and Gibson (2000) had two groups of participants where one was asked to prepare a speech while the other listened to a neutral recording. Participants were also offered choices of sweet, salty, high and low fat foods. Oliver et al., (2000) found that participants who were to provide a speech had an increase consumption of energy-dense and fatty foods in comparison to those in the control group. Job, Oertig, Brandstätter, and Allemand (2010) asked participants to complete achievement tasks that consisted of paper and pencil exercises followed by a taste test of various snacks. The laboratory experiment found that differences in implicit and explicit motivations are positively associated to unhealthy eating behaviours. Job et al., (2010) concluded that the disparity between the goals people try to achieve in their life and their affective needs can be stressful and can be a factor of unhealthy eating. Meanwhile, Habbab, Sheldon, and Loeb (2009) expanded previous research and argued that induced stress creates preferences for sweet foods. Stress was induced in the form of unsolvable puzzles and offered a range of sweets as a form of gratitude for taking part in their study. They observed that those who were given the unsolvable Sudoku puzzle consumed larger amount of food compared to the other group who had an easy Sudoku puzzle. Grunberg and Straub (1992) evaluated the role of gender on the effects of stress on eating. They manipulated stress by showing a group of participants a video about industrial accidents while the control group viewed a pleasant

travelogue. Participants had access to a range of sweet, salty and bland snacks while viewing the video. Using a Likert scale to rate the snacks offered, they found a significant interaction between gender and stress condition. Overall, women had an increased consumption of snacks compared to men. Additionally, Grunberg and Straub (1992) accounted that women in the stress condition consumed twice as much sweet and bland snacks in comparison to women in the control group. It was opposite for men who ate less under stress compared to the ones in the control group. The results of these studies provided an understanding that unhealthy snacks or commonly known as comfort foods are considered as stress reliever.

**Stress and Emotions.** Coping strategies can be classified to either problem or emotion focused (Lazarus & Folkman, 1984). Problem-focused strategies use practical methods in dealing stressors. Methods include active planning, time management, and problem solving. Moreover, problem-focused strategies tackle the main cause of the stressor. Thus, people who employ such strategies are less stressed. Conversely, emotion-focused strategies aid people in dealing stress by reducing the negative emotions attached to the stressors. In comparison to the latter strategy, this type provides a short-term solution to problems and it also have a negative effect on health. Techniques may include suppression of negative thoughts, avoidance, distraction, denial, alcohol consumption, drug use, and unhealthy eating. Conner et al., (1999) defined emotional eaters as those who have the impulse to eat when confronted situations that can provoke anxiety or negative emotions. A mounting body of research suggests that unhealthy eating is a major coping strategy in negative emotional states.

Macht and Simmons (2000) conducted a field study that investigated the inclination of women to eat in relation to their emotional condition. Participants were asked to rate their momentary emotional states on specific times throughout the day. The researchers reported

that negative emotions are the main reasons why people engage in unhealthy eating behaviours. Similar findings were found by Sims et al., (2008), that perceived stress was related to bad eating habits. They further stated that negative emotional states initiated by stressful events was a key factor in haphazard meal planning. Thus, leading people to consume foods with high sugar and fat content. In addition, Steptoe et al., (1998) stated that apart from the consumption of fast foods on weeks where stress was high, an increase intake of cheese and sweet foods was noted on participants who stated that mood control was influential of their food choices. Analogous results were presented by Tice, Bratslavsky, and Baumeister (2001) in their experiment that emotional distress can lead people to consume snack foods. They found strong support to this claim when they reversed the procedure through 'mood-freezing' manipulation. In this way, delayed gratification was effectively exhibited as well as the impulse to eat unhealthy snacks was eradicated. It can be argued that persistent consumption of such snacks can be detrimental to normal eating patterns (Tice et al., 2001). On the other hand, Wagner et al., (2014) evaluated the effects of comfort foods. They proposed that foods such as chocolates aided the dissipation of negative mood after asking their participants to watch videos that elicit negative affect and then served with their preferred comfort foods. However, in addition to their proposed argument stated earlier, Wagner et al., (2014) postulated that other foods may be viewed as having the same effect of comfort in the absence of their preferred ones. Further research in the stress and emotions were also conducted using diary studies.

Diary methods can be an effective method in capturing different moods, interactions and events of respondents. White, Horwath, and Conner (2013) viewed that negative emotions can serve as a trigger to uncontrollable and unhealthy eating. Using diaries as a medium of observation, participants rated how they felt in a day and recorded their food consumption the previous night. Their analysis noted that unhealthy eating patterns

corresponded to negative affect. In contrast, on days where participants felt they were in a calm and relaxed mood, they ate notable portions of fruits and vegetables. Thus, positive affect resulted in healthy eating patterns while unhealthy eating is a form of response to negative emotions (White et al., 2013). Meanwhile, Heron, Scott, Sliwinski, and Smyth (2014) conducted a survey among college women that explored the association between eating behaviours and mood. It was found that disordered eating behaviours did not precede higher levels of negative affect. However, when participants recorded that they experienced high levels of negative affect, they also noted that they engaged in disorderly behaviours such as eating large quantities of food and binge eating. Moreover, there seems to be a causal link between stress and emotion that affect a person's eating patterns and lifestyle choices.

### **Rationale of the Current Study**

The main purpose of this study is to explore the effects of stress on emotions and snack preferences among third level students. From the literatures outlined above, it is apparent that stress can have a negative influence on health via snack choices. Furthermore, enduring stress may be affiliated with choices of foods with fatty and high sugar content (Torres & Nowson, 2007). However, from the studies mentioned above that employed self-report and experimental methods, stress was manifested and represented in various ways making it difficult to ascertain which form of stress influenced people to choose unhealthy snacks over the healthy ones. In addition, majority of the research pertaining to stress and snacking were conducted in the laboratory. Also, results of these studies were mainly based on questionnaires and measures. It is therefore necessary to measure stress relative to the participants' experience, circumstances, and natural environment.

In reference to emotion, the literatures mentioned above explored emotional and mood changes over a period of time. It would be interesting to explore if stress can alter or transform emotions in a short period of time. In addition, past literatures focused on negative affect. It would only be appropriate to investigate changes in positive affect as well.

The present study attempts to extend earlier research on this area by measuring students' stress and emotional changes in an environment where they usually work on, the classroom. Since students are the main focus of this study, it is only reasonable to measure such changes in this setting where it can simulate exam conditions, which is considered stressful mostly by students. Furthermore, it aims to examine differences on unhealthy and healthy snacks as a form of comfort food or a stress reliever and if healthy foods can be considered and perceived as a comfort food if offered alongside an unhealthy snack.

As mentioned above, there is an immense amount of study to support claims that stress affects eating patterns. However, this is not evident on the practices in most of the colleges and universities. This is mainly due to the presence of vending machines that sell and dispense foods high in sugar, fats, and calories. For this reason, the study aims to provide an advance awareness of the effects of stress among third level students on their eating habits. In addition, the study intends to influence college policies by providing seminars and interventions to tackle the consequences of students' stress. Through these intercessions, regulation of snacks particularly the unhealthy ones may take place.

In this study, stress will be in a form of brain teasers that should somehow simulate unforeseen exam conditions that students undertake in their academic year. Stress' effects should reflect on the preference(s) made by students after taking the short brain teaser test. Two sets of brain teasers (easy and difficult) will be randomly allocated to participants. Also, unhealthy snacks will comprise of small chocolate bars (i.e. Cadbury Heroes, Celebrations) whereas fruits (i.e. bananas and oranges) will make up the healthy choices.

## **Hypotheses**

The following hypotheses will be tested in the current study.

**Hypothesis 1 (H<sub>1</sub>).** It is hypothesised that gender and the condition of the brain teaser test will have a significant interaction effect on the number of snacks taken particularly on unhealthy ones. In light of the previous research, chocolate bars should be perceived as a form of comfort food due to the stress produced by the difficult brain teaser. In this instance, the number of snacks taken from the table will be counted as an overall indicator of the effects of stress. A bar of chocolate will count as one response. Conversely, the participants in the easy condition will select healthy snacks than the other since they will not be as stressed compared to those in the difficult group. Therefore, the feelings of rewarding themselves with comfort food should not be as influential. Moreover, the number of healthy snacks taken from the table will be counted and in this case, a piece of fruit will count as one response as well.

**Hypothesis 2 (H<sub>2</sub>).** It is hypothesised that that there will be significant changes in the positive mood state of the participants after taking the brain teaser test particularly those in the difficult condition. The scores obtained in the Positive and Negative Affect Schedule Scale (PANAS) (Watson, Clark, & Tellegen, 1988) will be used as an indicator of any changes in the positive affect of the participants. This will be handed out before and after the brain teaser tests and changes should be discernible on participants in the difficult condition.



**Hypothesis 3 (H<sub>3</sub>).** In line with previous research, it is hypothesised that there will be significant increase in the negative mood state of the participants after taking the brain teaser test specifically those in the difficult condition. The PANAS (Watson et al., 1988) will be used as an indicator of any changes in the negative affect of the participants and will also be handed out before and after the brain teaser tests and changes should be noticeable on participants in the difficult condition.

**Hypothesis 4 (H<sub>4</sub>).** It is hypothesised that emotion and stress-related eating or the scores obtained from Factor 1 of Eating and Appraisal Due to Emotions and Stress (EADES) (Ozier, Kendrick, Knol, Leeper, Perko, & Burnham, 2007) will be a significant predictor of the number of snacks taken. A low score indicates greater emotion and stress related eating. With the aid of the questionnaire, the total score will be compared to the total number of snacks taken.

## METHODS

### Participants

A total of 44 students of Dublin Business School (20 males, 24 females), between the ages of 20 and 49 years ( $M = 28.3$ ,  $SD = 6.08$ ) took part in this study. All participants responded to both paper and online advertisements as well as oral invitations from their respective classes. Majority of the students were studying psychology and it may not be totally representative of the general population. Participation was voluntary. However, exclusion criteria were followed to eliminate students who are allergic to soya, nuts, and milk as well as participants who reported to have Diabetes Mellitus. In this study, 4 participants answered 'yes' to either questions and therefore excluded in the data analysis. These exclusions were made as these factors would affect the manner of answering some of the questions in the scales. In addition, such factors would have an impact on the choices of snacks at the end of the study. Finally, respondents were randomly allocated into two conditions, easy ( $n = 23$ ) and difficult ( $n = 21$ ).

### Design

This study utilised a quantitative approach employing mixed methods of true experimental and correlational designs. The experimental component of the study was a combination of between and within-group designs. The independent variables in the between-groups design were the easy and difficult brain teaser conditions. Snack choices of small chocolate bars and fruits were offered to all participants and so this comprised the within-group design. In addition to the snacks offered, positive and negative emotional changes before and after the brain teaser test were also measured using the PANAS scale (Watson et al., 1988) on all participants.

On the other hand, the correlational part of this study include individual differences in stress/emotional related eating patterns and the number of snacks taken from the table. The individual differences were measured using the factor 1 of the EADES questionnaire (Ozier et al., 2007). The scores obtained on this questionnaire was the predictor variable while the number of unhealthy or healthy snacks taken from the table was the criterion variable.

## **Materials**

The questionnaire packs were printed out in an A4 size white paper and participants filled each section using either pen or pencil. The measures administered are as follows:

The Positive and Negative Affect Schedule or PANAS (Watson et al., 1988) is a two 10-item psychometric scales that measure both positive and negative affect. Each scale consisted of words that described different moods such as distressed, hostile, guilty, inspired, interested, enthusiastic, etc. Participants indicated to what extent they felt at the present moment on a scale of 1-5 (1 = very slightly or not at all; 2 = a little; 3 = moderately; 4 = quite a bit; and 5 = extremely). Scores are added on each scale and can range from 10 - 50. A higher positive affect score indicates high levels of positive affect while a lower score on the

negative affect scale represents low levels of negative affect. In relation to this, Watson et al., (1988) suggested normal population mean scores on both scales (Positive affect score,  $M = 29.7$ ,  $SD = 7.9$ ; Negative affect score,  $M = 14.8$ ,  $SD = 5.4$ ). Both scales have high level of internal consistency and reliability (Positive Affect, Cronbach's  $a = .86$ ; Negative Affect, Cronbach's  $a = .87$ ).

The Eating and Appraisal Due to Emotions and Stress or EADES (Ozier et al., 2007) is a questionnaire that measures how individuals use food as a coping strategy with emotion and stress. EADES has 3 factors but factor 1 will only be utilised in this study as the other 2 factors are not related to the current investigations. Factor 1 primarily focused on emotion and stress associated eating behaviours as well as self-efficacy towards this conduct. It consisted of 24 statements such as 'I overeat when I am stressed' and 'I am confident I can control my eating when I am sad'. Participants are asked to determine their level of agreement on a scale of 1 - 5 by ticking the most appropriate response (strongly disagree, disagree, neutral, agree, strongly agree). Each statement has a cumulative score (strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly disagree = 5) while statements 2, 3, 4, 5, 8, 10, 13, 14, 16, 17, 18, 19, 22, 23, and 24 are reversed scored (i.e. if a participant answered strongly agree to any of these statements, it is scored as a 1). Factor 1 has a possible score range between 24 - 120, a lower score signifies greater emotion and stress connected eating behavior (Ozier, Kendrick, Leeper, Knol, Perko, & Burnham, 2008). Moreover, EADES Factor 1 has a high internal consistency and reliability (Cronbach's  $a = .949$ ).

Stress was introduced in the study in the form of easy and difficult brain teasers. Each set of brain teasers were composed of 10 questions, 5 of which were anagrams while the other 5 were number sequences. The anagrams in the easy set were relatively short (i.e., DORMITORY) compared to the ones in the difficult set (i.e., NOTIFIED MADMAN INTO

WATER). Similarly, the number sequences in the easy set were simple (i.e., 3 6 9 — 15) in contrast to the difficult set which involved complex calculations drawn in various shapes (see appendix). Instructions, examples, and extra paper for rough work were provided on both sets of brain teasers.

Finally, a small table filled with unhealthy snacks (i.e., a tub of Celebrations) and healthy fruit snacks (i.e., bananas and mandarin oranges).

## **Procedure**

The study took place in the classrooms of Dublin Business School. Participants who responded to the advertisements were randomly allocated to either easy or difficult brain teaser test. Allocation was made by sorting all odd entrants (first, third, fifth, etc.) to the easy condition while the even entrants (second, fourth, sixth, etc.) to the difficult condition.

Each questionnaire pack contained an information sheet outlining the general aims and the true nature of the research, deception was not required. It also included a consent form and safety questions such as ‘are you diabetic’ and ‘do you have allergies to any of these: nuts, milk, or soya?’. Participants then proceed to fill in the PANAS (Watson et al., 1988) scale pre-test followed by the Factor 1 of EADES (Ozier et al., 2007) questionnaire. After answering the questionnaires, the experimenter introduced the participants to the brain teasers by reading the instructions, “You will be presented a set of 10 questions which are divided into two parts. The first part tests your vocabulary skills while the second tests your numeracy skills. Answer these questions and if possible, use the extra paper provided for your rough work. Try answering the questions within 10 minutes. After answering the questions, please return the test paper, including the rough work, to the experimenter where he will hand you the second part of the experiment”.

After attempting to answer all 10 brain teasers, participants approached the experimenter situated at the front of the classroom to hand their papers. In this instance, the experimenter checked the answers to the safety questions. If ‘yes’ was answered in any of the questions, the paper is then sorted out to remind the experimenter not to offer snacks and exclude the concerned participant. Otherwise, the PANAS (Watson et al., 1988) scale post-test was administered. After submitting the PANAS (Watson et al., 1988) scale post-test, participants were told to “feel free to take any snacks from the table,” to which the experimenter counted the number of snacks taken and tallied on their corresponding test paper.

It is important to note that all questionnaire packs have written numbers in it mainly for convenience purposes in order to acquire accurate data. In addition, the experimenter used these numbers as a guide to the number of snacks taken by the participant at the end of the experiment and to highlight those who have indicated Diabetes and allergies. The last page of the questionnaire pack contained contact details of helplines and the experimenter for participants who were negatively affected by the statements and procedures of the experiment. A copy of all the scales and the brain teasers can be found in the appendix section of this paper.

## RESULTS

### Descriptive Statistics

The gender breakdown of the respondents is presented in Table 1. 44 students participated in this research (males,  $n = 20$ ; females,  $n = 24$ ). The age of the participants ranged from 20 to 49 years old ( $M = 28.3$ ;  $SD = 6.08$ ).

**Table 1: Frequency Table of Participants**

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	20	45.5	45.5	45.5
Female	24	54.5	54.5	100
Total	44	100	100	

The number of participants under each sub-group is shown in Table 2. Participants were randomly allocated into two sub-groups, easy ( $n = 23$ ) and difficult ( $n = 21$ ) conditions. The uneven split was due to the 4 participants who were excluded base on their answers to the allergy and Diabetes safety questions.

**Table 2: Frequency Table of the Two Sub-Groups**

	Frequency	Percent	Valid Percent	Cumulative Percent
Easy	23	52.3	52.3	52.3
Difficult	21	47.7	47.7	100
Total	44	100	100	

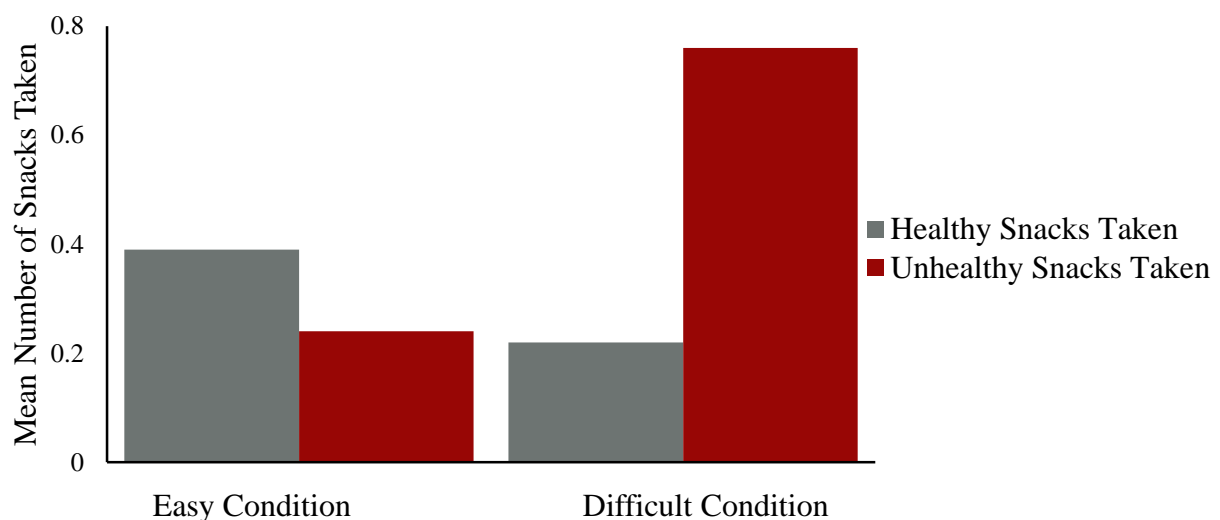
Table 3 summarises the mean scores and standard deviation of all the variables in this study. According to Ozier et al., (2007), the possible scores range from 24 - 120. The mean scores for Factor 1 of EADES was considerably high. It is notable as well that the mean scores for both pre and post-tests of positive affect were below the suggested normal population score of 29.7. While the pre-test negative affect score was below the suggested score of 14.8 and the post-test negative affect score was slightly above the normal population score.



**Table 3: Mean Scores and Standard Deviation of the Variables**

	<i>M</i>	<i>SD</i>
Factor 1 EADES Score	87.27	16.76
Healthy Snacks Taken	0.32	0.52
Unhealthy Snacks Taken	0.48	0.70
Total Snacks Taken	0.80	0.73
Pre-test Positive Affect	28.34	7.34
Post-test Positive Affect	26.95	10.28
Pre-test Negative Affect	13.23	4.97
Post-test Negative Affect	15.25	5.04

Figure 1 depicts the average number of snacks taken by participants on the easy and difficult conditions. The participants in the difficult condition had high preferences of unhealthy snacks ( $M = 0.76$ ;  $SD = 0.77$ ) compared to the healthy ones ( $M = 0.24$ ;  $SD = 0.44$ ). Although the preferential gap between the healthy and unhealthy snacks in the easy condition was not as noticeable as the one in the difficult group, participants in the easy condition chose



the healthy snacks ( $M = 0.39$ ;  $SD = 0.58$ ) over the unhealthy ones ( $M = 0.22$ ;  $SD = 0.52$ ).

**Figure 1: Mean Number of Healthy and Unhealthy Snacks Taken by Participants in Easy and Difficult Conditions**

The reliability and internal consistency of the questionnaires were also measured. The Factor 1 of EADES (Ozier et al., 2007) is a sub-scale consisted of 24 items ( $\alpha = .98$ ). The scale was found to be highly reliable and relatively high in internal consistency since anything over .7 is considered satisfactory. On the other hand, both positive and negative affect schedules of PANAS (Watson et al., 1988) consisted of 10 items. The Cronbach's Alphas for both pre and post-tests of the positive affect schedules were .86 and .94 respectively. While .87 and .79 were the values for both pre and post-tests of the negative

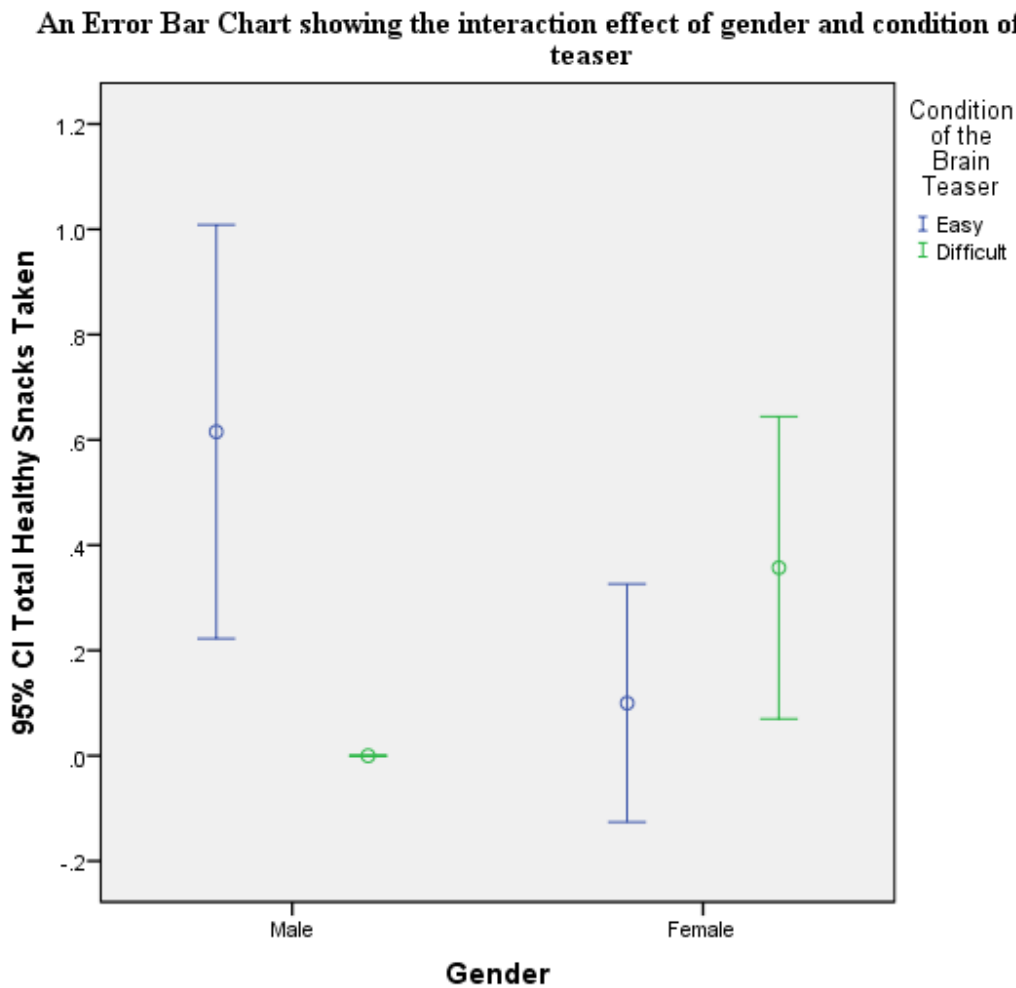
affect schedules respectively. The scales were also found to be reliable and high in internal consistency.

### **Inferential Statistics**

Four hypotheses were addressed in this study. (H<sub>1</sub>): It was hypothesised that gender and the condition of the brain teaser test will have a significant interaction effect on the number of snacks taken particularly on unhealthy ones; (H<sub>2</sub>): It was hypothesised that there will be significant changes in the positive mood state of the participants after taking the brain teaser test particularly those in the difficult condition; (H<sub>3</sub>): Correspondingly, it was hypothesised that there will be significant increase in the negative mood state of the participants after taking the brain teaser test specifically those in the difficult condition; and (H<sub>4</sub>): It was hypothesised that emotion and stress-related eating or the scores obtained from Factor 1 of EADES will be a significant predictor of the number of snacks taken.

In testing the first hypothesis (H<sub>1</sub>), assumptions were checked before conducting the parametric tests. There were no outliers in the data as by inspection of box plots. However, the data were not normally distributed as examined by histograms. The dependent variable (total healthy snacks) was positively skewed. In addition, the assumption of homogeneity of variances was violated as confirmed by Levene's test, ( $p = .001$ ) even if the cut-off point was cut down to .01. Since the non-parametric version is not possible in Statistical Package for Social Sciences (SPSS) and parametric tests such as Analysis of Variances (ANOVA) are robust, the test was still carried out. In reference to healthy snacks, a two-way between-groups ANOVA examined the role of gender and the condition of the brain teasers on the number of healthy snacks taken and found a significant interaction effect ( $F(1,40) = 8.47, p = .006$ ). Main effects cannot be interpreted. In order to describe the influence of one of the independent variables, the level of the other independent variable should be specified. The

interaction effect between gender and the conditions of the brain teasers is illustrated in figure 2.

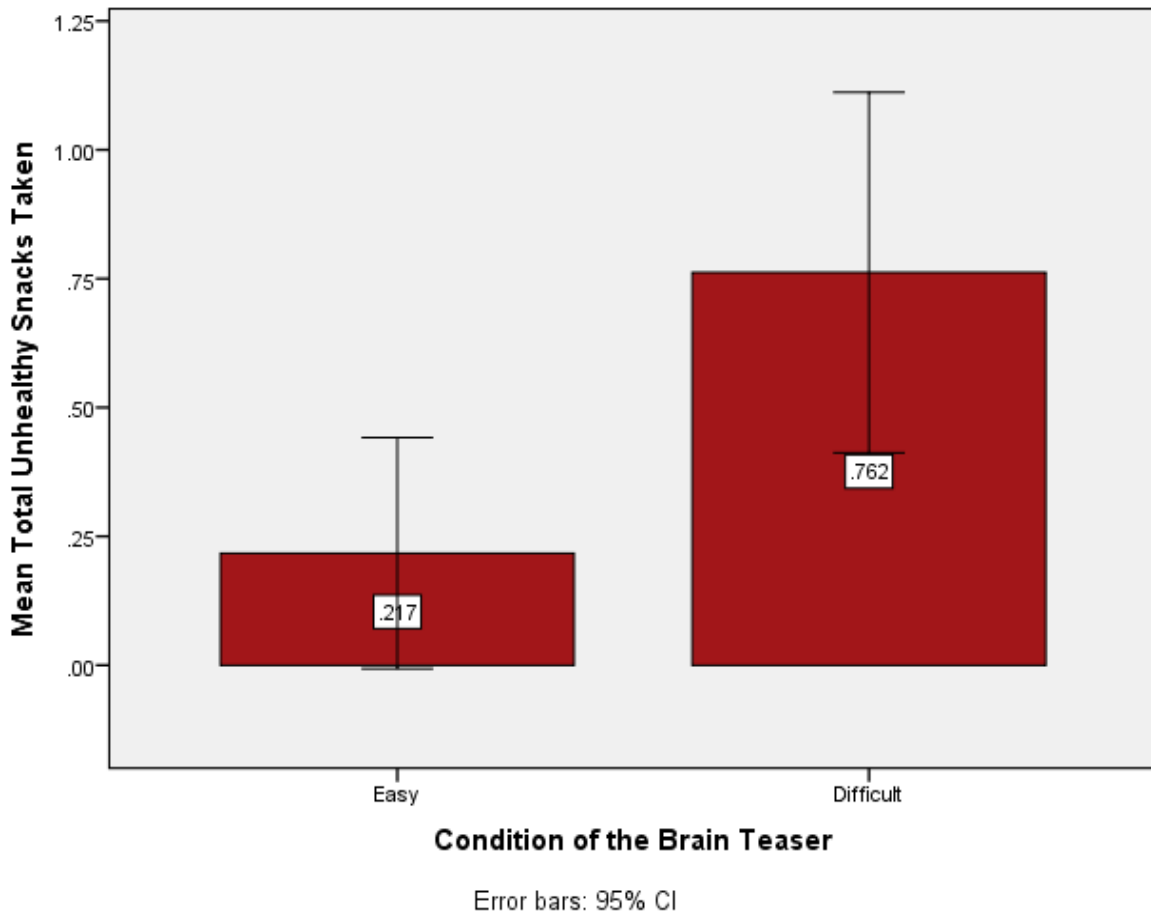


**Figure 2**

In contrast to unhealthy snacks, the dependent variable (total unhealthy snacks) was also positively skewed but the assumption of homogeneity of variances was met ( $p = .075$ ) as it was greater than .05. For the same reasons as above of using a parametric test, a two-way between-groups ANOVA examined the role of gender and the condition of the brain teasers on the number of unhealthy snacks taken and found no significant interaction effect ( $F(1,40)$ )

= 0.12,  $p = .736$ ). However, a main effect was reported for the condition of the brain teaser ( $F(1,40) = 5.64, p = .022$ ) with a small effect size of 12.4%. No main effects were reported for gender ( $F(1,40) = 1.11, p = .299$ ). Supplementary to figure 1, figure 3 depicts the average number of unhealthy snacks taken on both conditions.

**A Bar Chart showing the means of total unhealthy snacks taken on both easy and difficult conditions**



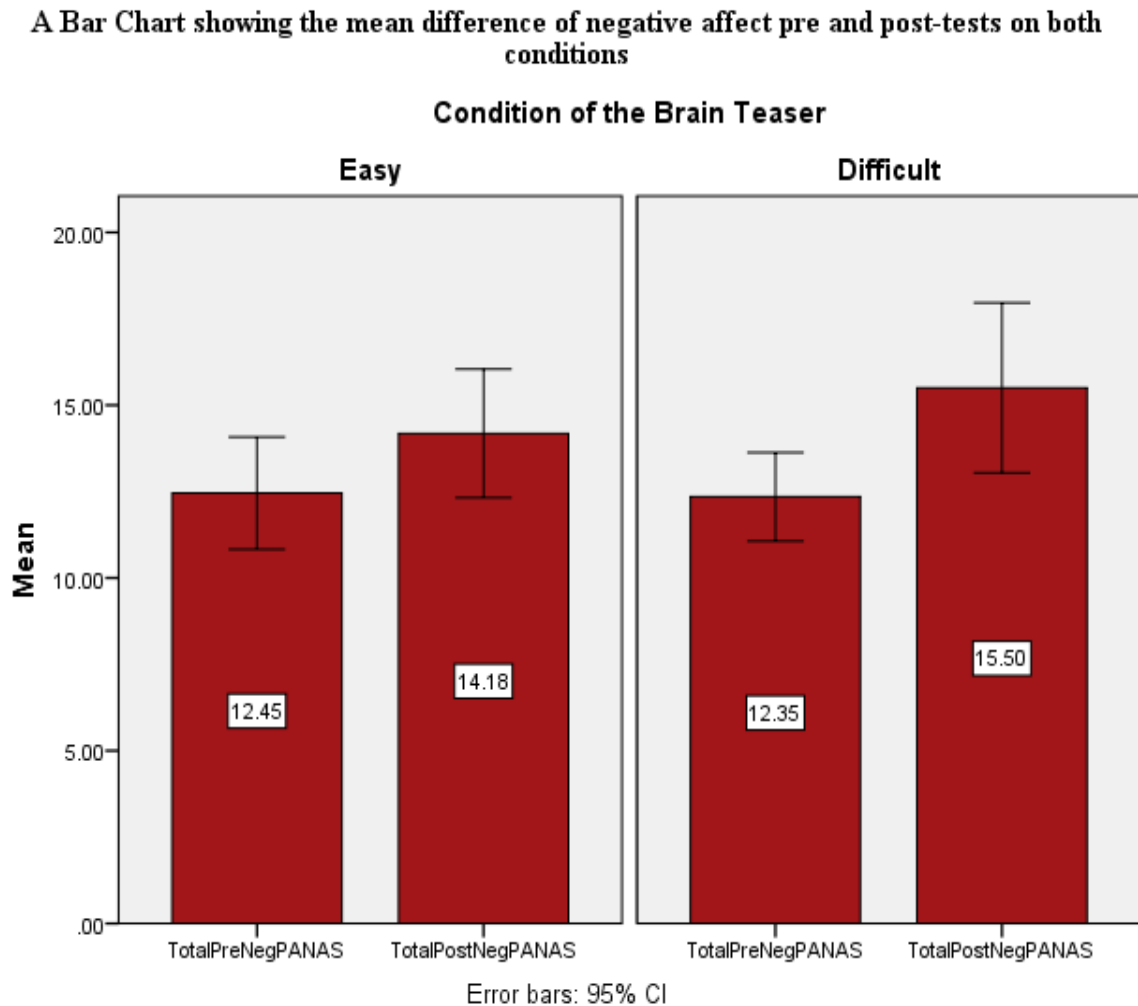
**Figure 3**

Similar to the first hypothesis, assumptions were checked for  $H_2$ . The scores for both pre and post-test on positive affect were both normally distributed. Also, no outliers noted as confirmed through inspection of boxplots. Test of equality of covariance revealed that the assumption was met ( $p = .607$ ) as it was greater than .001. The assumption of homogeneity of variances was also met as both values were greater than .05, (Pre-Positive Affect,  $p = .819$ ;

Post-Positive Affect,  $p = .816$ ). The assumption of sphericity was very unlikely met. This was assumed violated and so the results under the Greenhouse-Geisser line was referred. A factorial 2-way mixed ANOVA found no significant interaction effect between positive mood scores and the condition of the brain teaser, ( $F(1, 42) = 0.93, p = .340$ , effect size of 2.2%). In relation to main effects, there was no significant difference between pre and post-tests of positive affect, ( $F(1,42) = 1.39, p = .245$ , effect size = 3.2%). There was no significant difference as well between the two conditions of the brain teaser tests ( $F(1,42) = 0.32, p = .573$ , effect size of 0.8%).

Assumptions were also checked in relation to the negative affect scores ( $H_3$ ). The negative affect pre and post test scores were not normally distributed. In addition, a box plot detected two outliers in the scores of the pretest so these data were excluded from the analysis. The test for equality of covariance showed that assumption was met ( $p = .076$ ). Homogeneity of variances of the two tests were greater than .05 and so the assumption was met (Pre-Negative Affect,  $p = .463$ ; Post-Negative Affect,  $p = .087$ ). The results under the Greenhouse-Geisser line was used since the assumption of sphericity was very unlikely met. Similar to the rationale of  $H_1$  for using a parametric test, a factorial 2-way mixed ANOVA was carried out and found no significant interaction effect between negative mood scores and the conditions of the brain teaser, ( $F(1, 40) = 1.58, p = .216$ , effect size of 3.8%). In relation to main effects, there was a significant difference found between the two time points ( $F(1,40) = 18.57, p = .001$ ) with an effect size of 31.7%. More specifically, pairwise comparisons highlighted that negative mood increased after the brain teaser test (mean difference = 2.44,  $p = .001$ , CI (95%) 1.30 - 3.58). It can be concluded that the questions in the brain teaser tests had an impact on their negative mood states. However, there was no significant difference between the easy and difficult conditions ( $F(1,40) = 0.29, p = .591$ , effect size of 0.7%).

Figure 4 shows the main effects between the conditions of the brain teasers and negative affect scores.



**Figure 4**

Finally, linear regression was employed to test  $H_4$ . For this instance, the healthy and unhealthy snacks were combined into one variable. The predictor variable (Factor 1 EADES score) and the criterion variable (total number of snacks taken) were both normally distributed and no outliers shown through inspection of box plots. Curvilinear relationship was not an issue since both variables showed a linear relationship. Using simple regression,

it was found that the scores from Factor 1 EADES did not significantly predict the number of snacks taken at the end of the study, ( $F(1,42) = 0.16$ ,  $p = .692$ ,  $R^2 = -.02$ ). The null hypothesis is accepted.

## DISCUSSION

The principal aim of this research was to explore the relationship between stress, emotions, and snack preferences among third level students. The current study also investigated whether stress can alter or transform emotions in a short space of time. Furthermore, it aimed to examine the differences between healthy and unhealthy snacks as a form of comfort food or stress reliever and if a healthy food can be considered and perceived as a comfort food if offered alongside an unhealthy snack.

Four hypotheses were tested in this study. It was hypothesised that gender and the condition of the brain teaser test will have a significant interaction effect on the number of snacks taken particularly on unhealthy ones ( $H_1$ ). In relation to emotions, it was hypothesised that there will be significant differences in the positive mood state of the participants after taking the brain teaser test ( $H_2$ ). In contrast, there will be a significant increase in the negative mood state of the participants after taking the brain teaser test specifically those in the difficult condition ( $H_3$ ). Finally, it was hypothesised that emotion and stress-related eating or the scores obtained from Factor 1 of EADES (Ozier et al., 2007) were significant predictors of the number of snacks taken ( $H_4$ ).

### Interpretation of the Results



The present study yielded a combined significant and insignificant results across the four hypotheses. Albeit, it supported the claim that enduring stress is associated with preferences of foods rich in fat and sugar (Torres & Nowson, 2007).

In relation to the  $H_1$ , the results did not confirm the hypothesis since the interaction effect occurred in healthy snacks and not in the unhealthy ones. The results pertaining to  $H_1$  suggests that the influence of the brain teasers on healthy snacks would be dependent on the gender of the participant. Although there was no interaction effect noted between gender and the brain teasers on unhealthy snacks, a main effect occurred in the conditions of the brain teasers to the number of unhealthy snacks taken. Results indicated that participants in the difficult condition had significantly taken more chocolate bars than those in the easy condition. Thus, the participants' precedence of unhealthy snacks over fruits in this study conformed with the findings of Cartwright et al., (2003); Kandiah et al., (2008); and O'Connor et al., (2008) that stress can affect healthy eating choices. In addition, the main effects reported in this study may be compared to Habbab et al., (2009) and Job et al., (2010) findings since stress came in the form of mental stimulating tasks or puzzles. Although the current experimental protocol may be different from that of Oliver et al., (2000), which participants were asked to prepare a speech, it can be argued that such tasks require considerable amount of effort, enough to cause stress, which had a significant impact on the snack preferences. On the other hand, no main effects were detected between gender and the number of unhealthy snacks taken. This means that males and females did not differ in terms of the amount of unhealthy snacks taken. The inconspicuous differences may be due to the unfamiliarity of both sexes to the anagrams and the complex number sequences. Therefore, the brain teasers on both easy and difficult conditions had the same effect to both genders. Unlike Grunberg and Straub (1992), videos were utilised to manipulate stress, which had a significant effect on women compared to men. In addition, the participants of Heron et al.,

(2014); Kandiah et al., (2006); and Macht and Simmons (2000) studies were all women, and so their results were only applicable to that specific gender. Moreover, the results of the current study lend support to previous research that people who were stressed preferred sweet foods (Kandiah et al., 2006).

The second and third hypotheses referred to the emotional or mood changes of the participants and these were tested before and after they answered the brain teaser tests.  $H_2$  was tested and no significant interaction effect was seen between the positive mood scores (before and after test scores) and the brain teasers. In addition, there were no significant changes on their positive mood state before and after answering the brain teasers and there was no significant difference in the positive affect scores of participants in both easy and difficult conditions. Results suggest that the positive affect of all participants before answering the anagrams and number sequences remained constant up to the end of the study. In addition, the insignificant interaction and main effects could be due to the participants' emotional state prior to taking the experiment. Hence, the outcome of the positive mood measure may have been affected. It was found difficult to ascertain other reasons for this insignificant outcomes since the focus of previous literatures were on negative affect.

In contrast,  $H_3$  concerned the negative affect of the participants before and after answering the brain teasers. Similar to  $H_2$ , there was no significant interaction effect between the negative mood scores and the brain teaser tests. Regardless of the insignificant interaction effect, there was a significant difference on the negative mood states before and after the tests were solved. Results implied that the attempt to answer all ten brain teasers had an effect on their negative mood states. This is in concordance with the studies conducted by Sims et al., (2008) and Heron et al., (2014) that the state of being in a negative mood as invested from stressful events such as the ones manipulated in current study was related to unhealthy eating habits. Furthermore, the outcomes were also in line with the

postulation that mood control was an influential factor of food choices (Steptoe et al., 1998). Additionally, Wagner et al., (2014) stated that snacks such as chocolates aided the significant reduction of negative affect of their participants and results of this study lend support to that postulation. Although negative mood was not checked after participants had taken chocolates at the end of the study, it can be asserted that the fact participants had taken chocolate bars after the difficult test was enough to state that the brain teasers had an impact to their negative mood states. In spite of the matter that ‘mood-freezing’ manipulation (Tice et al., 2001) and diaries (White et al., 2013) were not in the procedure of the current study, the results confirmed that emotional distress and being in the state of negative mood were contributing factors in consumption of unhealthy foods. However, there was no significant difference found in the negative affect scores of participants in both easy and difficult conditions. The perceived complexity of the anagrams on both conditions could be the main reason for this indifference.

Finally, the Factor 1 of EADES questionnaire (Ozier et al., 2007) was used as an indicator of both emotions and stress-related eating. The present investigation found that emotion and stress-related eating were not predictors of the snacks taken at the end of the study. This finding did not confirm H<sub>4</sub>. According to Ozier et al., (2008), a lower score in this factor indicates greater emotion and stress related eating. The insignificant result can be explained through the average total scores of the participants. As denoted by the data, the total score was above the average suggesting high-levels of self-efficacy among the participants. The insignificant result can also be explained through the procedures carried out by the present research. Most of the literatures that found significant positive correlation to these variables utilised diary studies. For instance, Conner et al., (1999) concluded that snack consumption was positively correlated to daily hassles. Likewise, Steptoe et al., (1998) found that it was common for people to consume ‘fast foods’ on weeks when stress was

reported high. Meanwhile, White et al., (2013) stated that their participants engage in unhealthy eating behaviours on days when they felt sad and helpless. Base from these literatures, it can be argued that the duration of the diary studies had a significant impact on the correlation of emotions/stress-related eating to snacking.

### **The Strengths of the Present Study**

The main strength of the present study was that students' stress and emotional changes were measured relative to their everyday circumstances and natural environment. The experiment was conducted in a classroom and the experimental procedure was similar to exam settings.

The current study also attempted to evaluate the immediate effects of emotion/stress-related eating by providing participants choices of unhealthy snacks in the form of chocolate bars and healthy snacks such as bananas and oranges. Furthermore, the procedure of the study was simple, straightforward and it did not consume time for the respondents.

The supporting literatures outlined in this research mainly focused on negative affect. Using the PANAS scale (Watson et al., 1988), the present study counterbalanced between positive and negative affect. Immediate changes in their mood and emotions were also noted through the administration of the scales before and after taking the brain teaser tests.

The true nature of the study was detailed in the information sheet, which was handed out at the beginning of the study. Therefore, deception was not applied and was not needed.

It can be inferred that the negative feelings felt by the participants were due to the effects of the brain teasers and/or by the statements outlined by the questionnaires.

The current study was quantitative in nature and it employed mixed methods of true experimental and correlational designs. Hence, the data obtained from these methods can be applied to the general population contrary to a qualitative study, to which data can only be limited to a certain groups of individuals.

### **The Limitations and Weaknesses of the Present Study**

The trends in the data yielded by the present study has been influenced by limitations. First, the PANAS scale (Watson et al., 1988) that was used to indicate the changes in positive and negative affect of participants was an early version. An updated or expanded version of the scale called PANAS-X (Watson & Clark, 1999) is now commonly used by researchers. This scale also shows two different levels of mood measurement but it categorises 60 words and phrases that described feelings and emotions to 11 specific affects. It would be interesting to test if the broad positive affect words of the expanded version would yield significant results to H<sub>2</sub>.

Secondly, the stimuli and the materials used in this study may have also influenced the responses made by the participants. For instance, the anagrams used in the easy condition was considered complex as per comments of the participants after the experiment. Furthermore, the participants found that the easy anagrams did not complement the simplicity of the easy number sequences. Conjointly, the unhealthy snacks offered were limited to a particular brand of chocolate bars. Perhaps, a wider range of snacks like salty crisps or mini

cakes could have been used alongside the chocolate bars. Likewise, oranges and bananas were the only options for healthy snacks. Such fruits may not be preferred by some people and so future investigations should consider additional options for this.

Conjointly, confounding variables were present in the present research. The study was conducted in various times of the day and so the experimenter had no control over the participants' levels of hunger or engagement. The study should have been conducted in a fixed time when hunger and attention span should not be of a major issue. Additionally, a number of participants refused to take any chocolates after the study and this could be due to the post-Christmas season attitude of abstaining from sweets. Hence, it may have affected the outcomes of the research.

It can also be asserted that the nature of the questions in the EADES (Ozier et al., 2007) questionnaire may have influenced their decision to take any sweets from the table since it was administered in the early part of the study. Thus, the order of the experimental procedures may have influenced the snack intake of the participants and consequently affected the outcome of the statistical tests.

It can also be contended that majority of the participants were students undertaking psychology. Their knowledge of the subject matter may have influenced them in answering the questionnaires particularly the EADES (Ozier et al., 2007). Thus, the sample was not a good representation of the student population.

Finally, the sample size of the current study was an issue since it did not meet the criteria of the suggested number of participants. According to Cohen (1992), to achieve a medium effect size at a power of .80 for  $\alpha$  of .05, at least 64 participants are required. The small sample size may be attributed to the sampling technique used, which was self-selecting. The question remains whether the results would yield differently if the recommended number of participants was acquired.

## **Future Implications**

Regardless of the aforementioned limitations, the findings of the current investigations not only contribute to the mounting body of evidences regarding the relationship between stress and emotion-related eating behaviours but also has important implications to the governing bodies of educational institutions. Hence, the results of the present study along with past research should provide policy makers a deeper understanding of the influences of stress on students. It should also address the issue of students' direct and easy access to foods high in fat and sugar in spite of the rigorous campaigns in print and social media about living a healthy lifestyle.

It can also be asserted that the procedure and findings of the current research can be applied and tested to the wider population by simply enhancing or adjusting the methodology relative to the target population. For instance, one can investigate the effects of stress on snack preferences and emotions among office workers by providing them a series of work related tasks such as typing, editing, and filing documents. On that account, health care professionals, lecturers, and other occupations with high perceived stress levels can benefit from this study.

Finally, the present study can be of assistance to neuropsychologists with the aid of advanced technology such as brain scans in instituting a profound analysis of the physiology of stress and its effect on eating and emotions. Brain scanning can be incorporated to the procedures of this study. Results of such tests are deemed accurate and unambiguous in comparison to conventional questionnaires and scales, which are prone to confounding variables.

## **Conclusion**

The present research asserts that people who are under stress may resort to unhealthy eating as a form of coping strategy. It also showed that stress has a major impact on emotions, particularly on negative affect, which again relates back to unhealthy eating as a coping strategy. Thus, the results were relevant with previous literatures that highlighted the detrimental effects of stress towards health. It is also relevant to societal issues such as obesity and other dietary diseases. One can infer that the root cause of such problems relate back to stress and poor coping mechanisms.

It has been generally implied that life in academia can be physically and emotionally stressful. One can appraise the demands of academic work along with the sources of stress outlined earlier as taxing. Furthermore, eating has become one of the primary coping mechanisms of students and this is evident from their instant access to unhealthy snacks sold through vending machines. The current study not only aims to emphasise what previous research have argued but it also intends to influence policies to discuss and design interventions to deal the potentially inimical and harmful effects of stress towards students.



## REFERENCES

- Adam, T. C., & Epel, E. S. (2007). Stress, Eating, and the Reward System. *Physiology & Behavior*, *91*(4), 449-458 doi: 10.1016/j.physbeh.2007.04.011
- Banerjee, U., Bhattacharya, N. K., & Sanyal, N. (2014). Stress, Coping and Emotional Processing in Chronic Pain: A Comparative Analysis. *SIS Journal of Projective Psychology & Mental Health*, *21*(2). retrieved from: <http://search.ebscohost.com/login.aspx?>
- Baum, A. (1990). Stress, Intrusive Imagery, and Chronic Distress. *Health Psychology*, *9*(6), 653-675. doi: 10.1037/0278-6133.9.6.653
- Baum, A., & Grunberg, N.E. (1991). Gender, Stress, and Health. *Health Psychology*, *10*(2), 80-85. doi: 10.1037/0278-6133.10.2.80

- Cartwright, M., Wardle, J., Steggle, N., Simon, A. E., Croker, H., & Jarvis, M. J. (2003). Stress and Dietary Practices in Adolescents. *Health Psychology, 22*(4), 362. doi: 10.1037/0278-6133.22.4.362
- Cohen, J. (1992). A Power Primer. *Psychological Bulletin, 112*(1), 155. doi: 10.1037/0033-2909.112.1.155
- Conner, M., Fitter, M., & Fletcher, W. (1999). Stress and Snacking: A Diary Study of Daily Hassle and Between-Meal Snacking. *Psychology and Health, 14*(1), 51-63.
- Dalgleish, T. (2004). The Emotional Brain. *Nature Reviews Neuroscience, 5*(7), 583-589. doi: 10.1038/nrn1432
- Dallman, M. F., Pecoraro, N. C., & La Fleur, S. E. (2005). Chronic Stress and Comfort Foods: Self-Medication and Abdominal Obesity. *Brain, Behavior, and Immunity, 19*(4), 275-280. doi: 10.1016/j.bbi.2004.11.004
- Evans, G. W., & Stecker, R. (2004). Motivational Consequences of Environmental Stress. *Journal of Environmental Psychology, 24*(2), 143-165. doi:10.1016/S0272-4944(03)00076-8
- Grunberg, N. E., & Straub, R. O. (1992). The Role of Gender and Taste Class in the Effects of Stress on Eating. *Health Psychology, 11*(2), 97. doi: 10.1037/0278-6133.11.2.97

- Habbab, S., Sheldon, J. P., & Loeb, R. C. (2009). The Relationship Between Stress, Dietary Restraint, and Food Preferences in Women. *Appetite*, 52(2), 437-444. doi: 10.1016/j.appet.2008.12.006
- Heron, K. E., Scott, S. B., Sliwinski, M. J., & Smyth, J. M. (2014). Eating Behaviors and Negative Affect in College Women's Everyday Lives. *International Journal of Eating Disorders*, 47(8), 853-859. doi: 10.1002/eat.22292
- Job, V., Oertig, D., Brandstätter, V., & Allemand, M. (2010). Discrepancies Between Implicit and Explicit Motivation and Unhealthy Eating Behavior. *Journal of Personality* 78(4), 1209-1238. doi: 10.1111/j.1467-6494.2010.00648.x
- Kandiah, J., Yake, M., Jones, J., & Meyer, M. (2006). Stress Influences Appetite and Comfort Food Preferences in College Women. *Nutrition Research*, 26(3), 118-123. doi: 10.1016/j.nutres.2005.11.010
- Kandiah, J., Yake, M., & Willett, H. (2008). Effects of Stress on Eating Practices Among Adults. *Family and Consumer Sciences Research Journal*, 37(1), 27-38. doi: 10.1177/1077727X08322148
- Kolb, B., & Whishaw, I.Q., (2014). *An Introduction to Brain and Behavior* (Fourth Edition). New York: Worth Publishers
- Lazarus, R.S. (1966). *Psychological Stress and the Coping Process*. New York: McGraw-Hill

- Lazarus, R. S., & Folkman, S. (1984). Stress. *Appraisal and Coping*, 725.
- Macht, M., & Simons, G. (2000). Emotions and Eating in Everyday Life. *Appetite*, 35(1), 65-71. doi: 10.1006/appe.2000.0325
- Major, B., & O'Brien, L. T. (2005). The Social Psychology of Stigma. *Annual Review of Psychology*, 56, 393-421. doi: 10.1146/annurev.psych.56.091103.070137
- Martin, P. R., Lae, L., & Reece, J. (2007). Stress as a Trigger for Headaches: Relationship Between Exposure and Sensitivity. *Anxiety, Stress, and Coping*, 20(4), 393-407. doi: 10.1080/10615800701628843
- Ng, D. M., & Jeffery, R. W. (2003). Relationships Between Perceived Stress and Health Behaviors in a Sample of Working Adults. *Health Psychology*, 22(6), 638-642. doi:10.1037/0278-6133.22.6.638
- O'Connor, D. B., Jones, F., Conner, M., McMillan, B., & Ferguson, E. (2008). Effects of Daily Hassles and Eating Style on Eating Behavior. *Health Psychology*, 27(1S), S20. doi: 10.1037/0278-6133.27.1S20
- Oliver, G., Wardle, J., & Gibson, E.L. (2000). Stress and Food Choice: A Laboratory Study. *Psychosomatic Medicine* 62(6), 853-65. retrieved from: <http://eds.a.ebscohost.com/eds/>

Ozier, A. D., Kendrick, O. W., Leeper, J. D., Knol, L. L., Perko, M., & Burnham, J. (2008). Overweight and Obesity are Associated with Emotion-and Stress-Related Eating as Measured by the Eating and Appraisal Due to Emotions and Stress Questionnaire. *Journal of the American Dietetic Association, 108*(1), 49-56. doi: 10.1016/j.jada.2007.10.011

Ozier, A. D., Kendrick, O. W., Knol, L. L., Leeper, J. D., Perko, M., & Burnham, J. (2007). The Eating and Appraisal Due to Emotions and Stress (EADES) Questionnaire: Development and Validation. *Journal of the American Dietetic Association, 107*(4), 619-628.

Pinel, J.P.J. (2014). *Biopsychology* (Eighth Edition). Edinburgh: Pearson Education

Prinz, J. (2004). Emotions Embodied. Thinking about Feeling, Solomon (ed) Oxford: Oxford University Press, 44-59. retrieved from: <http://subcortex.com/PrinzEmotionsEmbodied.pdf>

Schuster, M. A., Stein, B. D., Jaycox, L. H., Collins, R. L., Marshall, G. N., Elliott, M. N., Zhou, A.J., Kanouse, D.E., Morrison, J.L., & Berry, S. H. (2001). A National Survey of Stress Reactions After the September 11, 2001, Terrorist Attacks. *New England Journal of Medicine, 345*(20), 1507-1512. doi: 10.1056/NEJM200111153452024

- Sims, R., Gordon, S., Garcia, W., Clark, E., Monye, D., Callender, C., & Campbell, A. (2008). Perceived Stress and Eating Behaviors in a Community-Based Sample of African Americans. *Eating Behaviors*, 9(2), 137-142. doi: 10.1016/j.eatbeh.2007.06.006
- Step toe, A. (1991). Invited Review: The Links Between Stress and Illness. *Journal of Psychosomatic Research*, 35(6), 633-644. doi: 10.1016/0022-3999(91)90113-3
- Step toe, A., Lipsey, Z., & Wardle, J. (1998). Stress, Hassles and Variations in Alcohol Consumption, Food Choice and Physical Exercise: A Diary Study. *British Journal of Health Psychology*, 3(1), 51-63. doi: 10.1111/j.2044-8287.1998.tb00555.x
- Taylor, S.E. (2015). *Health Psychology* (Ninth Edition). New York: McGraw Hill Education
- Tice, D. M., Bratslavsky, E., & Baumeister, R. F. (2001). Emotional Distress Regulation Takes Precedence Over Impulse Control: If You Feel Bad, Do It!. *Journal of Personality and Social Psychology*, 80(1), 53. doi: 10.1037/0022-3514.80.1.53
- Torres, S.J., & Nowson, C.A. (2007). Relationship Between Stress, Eating Behavior, and Obesity. *Nutrition* 23(11), 887-894.
- Tsigos, C., & Chrousos, G. P. (2002). Hypothalamic–Pituitary–Adrenal Axis, Neuroendocrine Factors and Stress. *Journal of Psychosomatic Research*, 53(4), 865-871. doi: 10.1016/S0022-3999(02)00429-4

- Wagner, H. S., Ahlstrom, B., Redden, J. P., Vickers, Z., & Mann, T. (2014). The Myth of Comfort Food. *Health Psychology, 33*(12), 1552. doi: 10.1037/hea0000068
- Watson, D., & Clark, L. A. (1999). The PANAS-X: Manual for the Positive and Negative Affect Schedule-Expanded Form. Ames: The University of Iowa
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and Validation of Brief Measures of Positive and Negative Affect: the PANAS Scales. *Journal of Personality and Social Psychology, 54*(6), 1063. doi: 10.1037/0022-3514.54.6.1063
- Weems, C. F., Watts, S. E., Marsee, M. A., Taylor, L. K., Costa, N. M., Cannon, M. F., Carrion, V.G., & Pina, A. A. (2007). The Psychosocial Impact of Hurricane Katrina: Contextual Differences in Psychological Symptoms, Social Support, and Discrimination. *Behaviour Research and Therapy, 45*(10), 2295-2306. doi: 10.1016/j.brat.2007.04.013
- White, B. A., Horwath, C. C., & Conner, T. S. (2013). Many Apples a Day Keep the Blues Away—Daily Experiences of Negative and Positive Affect and Food Consumption in Young Adults. *British Journal of Health Psychology, 18*(4), 782-798. doi: 10.1111/bjhp.12021
- Zafar, N., & Mubashir, T. (2012). Emotional Distress and Coping Strategies in University Students after the Death of Parental Figure. *Journal of Behavioural Sciences, 22*(3), 90. retrieved from:<http://search.ebscohost.com/login.aspx?>

## **APPENDIX**

### **Information Sheet**

### **Safety Questions & Consent Form**

#### **Scales**

Pre-PANAS

Factor 1 EADES

Post-PANAS

#### **Brain Teasers**

Easy

Difficult

#### **Debrief Sheet**



## **STRESS, EMOTIONS, & SNACK CHOICES EXPERIMENT**

Dear Participant,

My name is Paolo and I am conducting research in the Department of Psychology that explores the relationship between stress, emotions, and snack preferences. This research is being conducted as part of my studies and will be submitted for examination.

You are invited to take part in this study and participation involves answering a 10-item brain teaser test and completing and returning the attached anonymous questionnaires. The length of the study may last for up to 15 minutes. While the measures ask some questions that might cause some minor negative feelings, it has been used widely in research. If any of the questions do raise difficult feelings for you, contact information for support services are included in the final page.

Participation is completely voluntary and so you are not obliged to take part.

Participation is anonymous and confidential. Thus, response cannot be attributed to any one participant. For this reason, it will not be possible to withdraw from participation after the questionnaires have been collected.

The questionnaires will be securely stored and data from the questionnaires will be transferred from the paper record to electronic format and stored on a password protected computer.

Should you require any further information about the research, please contact:

Thank you for taking the time to take part in this study.

Are you diabetic? **YES** **NO**

Do you have allergies to any of these: nuts, milk, or soya? **YES** **NO**

I hereby give my consent to take part in this study **YES** **NO**

Sex **MALE** **FEMALE**

Age \_\_\_\_\_

### Pre-PANAS Scale

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way **right now**, that is, **at the present moment**. Use the following scale to record your answers.

- |          |                             |
|----------|-----------------------------|
| <b>1</b> | very slightly or not at all |
| <b>2</b> | a little                    |
| <b>3</b> | moderately                  |
| <b>4</b> | quite a bit                 |
| <b>5</b> | extremely                   |

- |                  |                  |
|------------------|------------------|
| _____ interested | _____ irritable  |
| _____ distressed | _____ alert      |
| _____ excited    | _____ ashamed    |
| _____ upset      | _____ inspired   |
| _____ strong     | _____ nervous    |
| _____ guilty     | _____ determined |
| _____ scared     | _____ attentive  |
| _____ hostile    | _____ jittery    |



<b>9</b>	I am confident I can control my eating when I am sad.					
<b>10</b>	I eat to avoid dealing with problems.					
<b>11</b>	I am confident I can control my eating when I am upset with myself.					
<b>12</b>	I am confident I can control my eating when I feel upset.					
<b>13</b>	I feel out of control when I eat.					
<b>14</b>	I eat when I am frustrated.					

		<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
<b>15</b>	I am confident I can control my eating when I am frustrated.					
<b>16</b>	I use food to cope with my emotions.					
<b>17</b>	I eat when I am tired.					
<b>18</b>	I eat when I am angry.					
<b>19</b>	I eat when I am sad.					
<b>20</b>	I am confident I can control my eating when I am anxious.					
<b>21</b>	I am confident I can control my eating when I am relieved.					
<b>22</b>	I eat when I am anxious.					
<b>23</b>	I eat when I am relieved.					
<b>24</b>	I do not have control over how much I eat.					

***PLEASE WAIT FOR FURTHER INSTRUCTIONS BEFORE  
CONTINUING***

**Easy Brain Teasers**

*You will be presented a set of 10 questions which are divided into two parts. The first part tests your vocabulary skills while the second tests your numeracy skills. Answer these questions and if possible, use the extra paper provided for your rough work. Try answering the questions within 10 minutes. After answering the questions, please return the test paper, including the rough work, to the experimenter where he will hand you the second part of the experiment.*

Part 1: An ANAGRAM is a rearrangement of the letters of one word or phrase to form another word or phrase using all the original letters exactly once.

In this short test, you must rearrange all the letters given to fit the clue.

For example:

THE EARTHQUAKES      =      THAT QUEER SHAKE

1. SCHOOL MASTER
2. DEBIT CARD
3. DORMITORY
4. GIVE A DEMO
5. I SPARED

Part 2: In mathematics, a sequence is a string of numbers that follow a particular pattern.

For example: 2, 4, 6, 8, 10, 12...

The pattern in this sequence is 2, we add 2 to the previous number to get the next number.

Below are simple number sequences. What are the missing numbers in the sequences shown below?

6.            3      6      9      \_\_\_      15
7.            5      10     \_\_\_     20     25
8.            \_\_\_     16     24     32     40
9.            75     \_\_\_     125   150   175
10.           24     32     40     48     \_\_\_

### Difficult Brain Teasers

*You will be presented a set of 10 questions which are divided into two parts. The first part tests your vocabulary skills while the second tests your numeracy skills. Answer these questions and if possible, use the extra paper provided for your rough work. Try answering the questions within 10 minutes. After answering the questions, please return the test paper, including the rough work, to the experimenter where he will hand you the second part of the experiment.*

Part 1: An ANAGRAM is a rearrangement of the letters of one word or phrase to form another word or phrase using all the original letters exactly once.

In this short test, you must **rearrange all the letters** given to create a new phrase.

For example:

THE EARTHQUAKES      =      THAT QUEER SHAKE

1.      NOTIFIED MADMAN INTO WATER
2.      THE FINE GAME OF NIL
3.      NAIL-BITING REFRESHES THE FEET
4.      STATUE OF LIBERTY
5.      I'M A DOT IN PLACE

**Part 2:** In mathematics, a sequence is a string of numbers that follow a particular pattern.

For example:

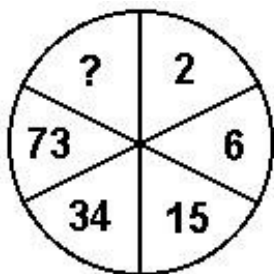
2, 4, 6, 8, 10, 12...

The pattern in the sequence above is 2, we add 2 to the previous number to get the next number.

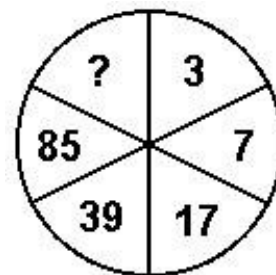
Using the four fundamental operations (addition, subtraction, multiplication, and division)

What are the missing numbers in the sequences shown below?

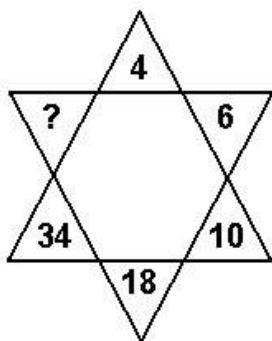
6.



10.



7.

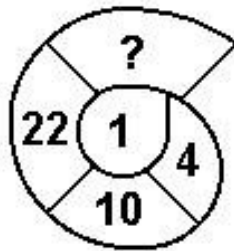




8.

2	5	9	14	?
4	8	13	19	?

9.



### Post-PANAS Scale

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers.

- |   |                             |
|---|-----------------------------|
| 1 | very slightly or not at all |
| 2 | a little                    |
| 3 | moderately                  |
| 4 | quite a bit                 |
| 5 | extremely                   |

\_\_\_ interested

\_\_\_ irritable

\_\_\_ distressed

\_\_\_ alert

\_\_\_ excited

\_\_\_ ashamed

\_\_\_ upset

\_\_\_ inspired

\_\_\_ strong

\_\_\_ nervous

\_\_\_ guilty

\_\_\_ determined

_____	scared	_____	attentive
_____	hostile	_____	jittery
_____	enthusiastic	_____	active
_____	proud	_____	afraid

<b>For experimenter use only:</b>	
<b>H</b>	
<b>U</b>	

### **DEBRIEF SHEET**

*Thank you for taking part in this study.*

*The overall research aim in this study is to determine if there is a relationship between the variables stress, emotions, and eating habits.*

*If you have any further questions or concerns please contact me Paolo B. Yaranon at xxxx or to my supervisor xxxx. A summary of the results of this study will be sent to you by request. Please note that records of this study will be kept strictly confidential and will be kept in a locked file. If you were affected by the nature of the study, please see attached helplines at the end of this sheet.*

**National Eating Disorders Association Confidential Helpline** *1-800-931-2237*

*(Available Monday to Thursday, 9AM - 9PM; Friday 9AM - 5PM)*

**The AWARE Support Line** *1890 303 302 or*

*(Available Monday to Sunday, 10AM - 10PM)*  
*[supportmail@aware.ie](mailto:supportmail@aware.ie)*

**Samaritans Free Helpline**

*116 123 or*

*(Open 24 hours a day)*