



The Correlation between Chocolate Consumption Behaviors and Stress Levels in Secondary School Students in Bangkok Metropolitan Region

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ABSTRACT: Chocolate has shown to be linked with stress relief, better memory, and better mood in some reports. Also, chocolate consumption is one of the popular food indulgences in Thailand. Thus, this survey research aims to investigate the correlation between chocolate consumption behaviors and stress levels in secondary school students in the Bangkok metropolitan region. We also try to observe the habits of consuming chocolate in Thai secondary school students and how this consumption of chocolate will be related to stress levels. We collected a sample group voluntarily by using online questionnaires, which obtained a total of 335 participants. The questions were assessed on a Likert-scale from 1 to 5 and were then analyzed by valid percentages, mean, standard deviation, one-way ANOVA(F-test), and the Pearson correlation. The results of the study reveal that chocolate consumption has a significant role in stress reduction among secondary school students; however, the R-value of 0.284 in this study is quite low, which indicates a slight correlation between chocolate consumption and stress levels. Focusing on each gender, it is evident that females tend to have more stress than males. Also, we observed that different grades have different stress levels. This study could be further improved by expanding the age demographic of the participants to not only cover teenagers but also by increasing the radius of the survey region to cover more people. Nevertheless, this research suggests that consuming chocolate could be an option in relieving stress.

KEYWORDS: Chocolate, Consumption behaviors, Stress, Secondary school students

INTRODUCTION

In recent years, chocolate has become more popular among adolescents in Thailand, since there has been a development of a wide range of delicious and unique chocolate products (Jadoul, 2022). There are also various types of chocolate to choose from, such as beverages, bakeries, ice cream, and chocolate bars. Moreover, dark chocolate, milk chocolate, and white chocolate are the three major flavors of chocolate bars enjoyed by customers of all ages across the world. Chocolate is mainly extracted from cocoa beans, which are known to be a rich source of flavonoids, a compound found in plants (Scott, 2021). Functional ingredients such as methylxanthine, caffeine, and theobromine are also recognized in chocolate, which all have the potential to influence neurocognitive function (Socci et al., 2017). The amount of compounds in the chocolate depends on the concentration of the cocoa beans; the darker it is, the more it contains. Dark chocolate contains these compounds the most, which is more than 35%, followed by milk chocolate with 20-30%, and white chocolate which has only cocoa butter (Bigler, 2020). As far as chocolate is concerned, it is a high-energy food that contains high sugar and saturated fat; too much consumption would lead to a risk of cardiovascular disease, acne, high blood pressure, and diabetes (Hotchemist, 2021). Nevertheless, consuming in moderation still provides various beneficial roles, including being a good energy source, reducing heart disease risk, providing antioxidants such as epicatechin and gallic acid, improving brain function, and protecting the skin from the sun (Gunnars, 2018). A stress hormone released by adrenal glands called cortisol helps the body to boost daily performance and remain alert in stressful situations, but occurring over time leads to several health conditions (Davidson, 2021). According to a study in the Nestle Research Center in Lausanne, Switzerland, it was also recognized that consuming dark chocolate daily likely reduces stress hormone levels in individuals who have high anxiety levels; in fact, chocolate can reduce human stress levels by lowering cortisol levels and neurohormonal hormones (Anon, 2019).

Nowadays, a wide range of ongoing stress becomes more frequent among students in secondary education, which can lead to mental health problems such as depression, anxiety, aggression, physical illness, and substance use. It is imperative to understand and learn how to manage stress (World Health Organization, 2023). Furthermore, gender differences relate to different ways to



respond to stress, both physically and mentally. Women are more likely to be diagnosed with anxiety disorder than men, meanwhile, they are good at socially connecting with others at work, which is crucial to their stress management strategies in the future (American Psychological Association, 2012). We also need to consider that stress could be contributed from numerous aspects; for instance, work, personal relationships, financial, and academic demands (Elizabeth Scott, 2022). Academic stress is likely to be associated with high school students, with the pressure of getting an acquired seat in their anticipated college. Mental health issues can directly impact a student's academic performance, which leads to difficulties concentrating in class, a student's social interactions, and also a student's emotional stability in coping with stress (Erdmann, 2023).

We realized the significant problems related to stress and the importance of reducing it. Since there is no study in Thailand about the correlation between chocolate consumption behavior and stress levels in secondary school students in Bangkok. We decided to conduct a survey to find the relation between the two variables. The result of this study will aid in increasing awareness of chocolate consumption and provide approaches for future studies.

METHODOLOGY

This survey research was conducted to reveal the correlation between the consumption of chocolate and stress levels in teenagers in Bangkok by using online questionnaires (Instagram and Line). The questionnaires consisted of 43 questions, which were categorized into 3 sections, including 1) general information, 2) chocolate consumption, and 3) stress level. The survey used a volunteer sampling method in this study. The questionnaires contained multiple choices, which can be measured on a Likert-scale of 1 to 5 (let 1 be strongly disagree, 2 be disagree, 3 be neutral, 4 be agree, and 5 be strongly agree). Before these questionnaires were published on online platforms publicly, they were evaluated by three specialists to determine whether Item-Objective Congruence index (IOC) scores were higher or equal to 0.5. The reliability of our questionnaires was determined using Cronbach's alpha on the pilot study group, and we obtained a reliability score of 0.825, which is acceptable (Taber, 2018). SPSS (Statistical Product Service Solutions version) is used to perform statistical analysis of data for descriptive statistics, ANOVA, and Pearson correlation. The p-value that is less than 0.05 is considered significant in this study.

INSTRUMENT

General Information

- 1) Gender
- 2) Grade
- 3) Conditions
- 4) What type of chocolate do you usually eat?
- 5) Which form of chocolate do you consume the most?
- 6) Which form of chocolate do you consume the least?

Chocolate consumption habits

- 1) I usually eat chocolate every day.
- 2) I usually eat chocolate more than once a day.
- 3) The reason why you buy chocolate is because you like it in the first place.
- 4) You crave chocolate when you are feeling stressed.
- 5) You crave chocolate when you are feeling at ease.
- 6) I feel stressed every time I don't eat chocolate.
- 7) I want to eat chocolate every time I have to work or have a test.
- 8) I feel less depressed after consuming chocolate.
- 9) I usually eat a lot of chocolate at a time.
- 10) I enjoy trying different types of chocolate.
- 11) I tend to eat chocolate impulsively, without planning.
- 12) I prefer chocolate with added ingredients(nuts, fruits, etc.) over plain chocolate.
- 13) I tend to eat larger quantities of chocolate during periods of high stress.
- 14) I am aware of the calories of the chocolate I consume during stressful times.



- 15) I notice a change in my chocolate consumption patterns during particularly stressful situations.
- 16) I usually eat chocolate after every meal.
- 17) I consciously choose specific types of chocolate based on their perceived calming effects during stress.

Stress levels

- 1) I do not have enough hours in the day to do all the things that I must do.
- 2) I ignore problems in the hope that they will go away.
- 3) I manage to finish my assignments by myself to ensure they are done properly.
- 4) I feel that there are too many deadlines in my life that are difficult to meet.
- 5) My self confidence is lower than I would like to be.
- 6) I frequently have guilty feelings if I relax and do nothing.
- 7) I find myself thinking about problems even when I am supposed to be relaxing.
- 8) I feel tired even when I wake after an adequate sleep.
- 9) I have a tendency to talk quickly.
- 10) My appetite has changed, I have either a desire to binge or have a loss of appetite.
- 11) If something or someone really annoys me I will bottle up my feelings.
- 12) I usually get upset when something happens unexpectedly.
- 13) I have been afraid of making mistakes.
- 14) I often feel sad and depressed.
- 15) Increase in muscular aches and pains especially in the neck, head, lower back, shoulders.
- 16) When I am stressed, I find myself grinding my teeth.
- 17) Sometimes I have difficulty breathing.
- 18) My hands or feet are cold.
- 19) I feel my heart beating stronger or faster than usual sometimes.
- 20) I usually bite my nails.

RESULTS AND DISCUSSION

Table 1. General information of participants

Personal Information	Frequency	Valid Percentage
Gender		
Male	102	30.4
Female	228	68.1
Others	5	1.5
Total	335	100.0
Grade		
Grade 7	11	3.3
Grade 8	23	6.9
Grade 9	23	6.9
Grade 10	117	34.9
Grade 11	131	39.1
Grade 12	30	9.0
Total	335	100.0
Condition		
Yes	59	17.6
No	276	82.4
Total	335	100.0



What type of chocolate do you usually eat?		
Dark chocolate	111	33.1
Milk chocolate	197	58.8
White chocolate	25	7.5
I never eat chocolate.	2	0.6
Total	335	100.0
Which form of chocolate do you consume the most?		
Beverage	64	19.1
Cake	18	5.4
Bar	144	43.0
Cookie	28	8.4
Brownie	30	9.0
Ice cream	49	14.6
Never eat chocolate	2	0.6
Total	335	100.0
Which form of chocolate do you consume the least?		
Beverage	79	23.7
Cake	76	22.8
Bar	45	13.5
Cookie	56	16.8
Brownie	29	8.7
Ice cream	46	13.8
Never eat chocolate	3	0.9
Total	335	100.0

In Table 1, the data represents the details of teenagers in the Bangkok metropolitan region collected. The majority were 228 females (68.1%), followed by 102 males (30.4%), and 5 non-binaries (1.5%). 39.1% of the participants studied in grade 11, while 34.9% in grade 10, and 9% in grade 12. Most of the respondents rather consume milk chocolate than other types, which include dark and white chocolate. Deeper in detail, the conducted statistics show that chocolate bars were chosen as the most consumed chocolate form among given categories with a number of 43%, in contrast, chocolate beverages were selected as the least preferred form of consumption.

Table 2. Descriptive statistics (Mean and Standard Deviation)

Variables	Mean	Std. Deviation	N
Chocolate consumption habits	2.797	0.608	335
Stress level	3.413	0.611	335



Table 2 indicates that among 335 participants, the average score and standard deviation of chocolate consumption were found to be 2.797 and 0.608, respectively. Compared to the mean of our question rate which was 2.5, this suggests that Thai teenagers have a moderate rate of eating chocolate. In addition, the results show that the mean score of participants' stress level is 3.4313 and its standard deviation is 0.608, this displays that most of the participants have a high level of stress.

Table 3. One-way ANOVA table; Stress levels and Gender

	SS	df	MS	F	P
Between groups	4.21	2	2.106	5.807*	0.003
Within groups	120.407	332	0.363		
Total	124.619	334			

*Significant at the 0.05 level

In Table 3, the different types of gender have significant effects on stress levels. The table shows the mean square between groups and the mean square within groups, which are 2.106 and 0.363, respectively. It conveys that gender has a direct effect on anxiety level with the p-value of 0.003.

Table 4. One-way ANOVA table; Stress levels and Grades

	SS	df	MS	F	P
Between groups	6.578	5	1.316	3.667*	0.003
Within groups	118.040	329	0.359		
Total	124.619	334			

*Significant at the 0.05 level

In Table 4, it clearly illustrates that different grades people studied have significant impacts on stress levels with the p-value of 0.003. And this data also indicates the mean square between and within groups which are 1.316 and 0.359, correspondingly.

Table 5. The correlation between Chocolate consumption habits and Stress levels

		Stress level	Chocolate consumption habits
Stress level	Pearson's Correlation	1	0.284**
	Sig. (2-tailed)		<.001
	N	335	335

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

Table 5 demonstrates the Pearson correlation coefficient linking the chocolate consumption to stress level. According to the correlation performed on 2 factors, the findings reveal a low correlation of 0.284 in r-value with significant. This insight that



consumption of chocolate is slightly related to anxiety levels. The reason behind the correlation between chocolate and stress is likely due to the presence of cocoa polyphenols in chocolate, which was shown to help reduce stress levels in teenagers (Al Sunni & Latif, 2014).

According to Table 2, the participants had a moderate level of chocolate consumption but had a high stress level. The high stress level in our participants could partly be due to the type of chocolate which may contain less cocoa polyphenols. In addition, people have a lot of stress, especially teenagers, due to the high workload in school and pressure from family and society. This is supported by a study from Bethune, where they report that American teenagers were feeling stressful to a level that is similar to that of adults and may even be higher if compared throughout the school year (Bethune, 2014). From the survey, most of the respondents were female, where most of them preferably eat milk chocolate (with 58.8%), although a minority reported never eating chocolate (with 0.6%). Thus in Table 3, we used a one-way analysis of variance to find out the interrelation between stress levels and genders. The result showed gender has a direct effect on anxiety level. This could likely be due to the majority of the participants being females. Females are known to have higher stress levels than males. This is supported by a book named “European Review,” which showed that women in high positions have higher stress levels than men and need more methods of stress management (Frankenhaeuser, 1996).

In Table 4, we focused on the correlation between stress levels and grades. We found that different grades people studied have significant impacts on stress levels. This contradicts the study from “Stress and the higher education student: a critical review of the literature,” which showed that stress rises among students the higher education they study. (Robotham & Julian, 2006). Moreover, we found a correlation between chocolate consumption habits and stress levels by using the Pearson correlation coefficient. The outcome revealed a marginally correlation of 0.284 in r-value, implying that consumption of chocolate is somewhat related to stress levels. This is evidenced in “Effects of chocolate intake on Perceived Stress; a Controlled Clinical Study,” which showed that daily consumption of dark and milk chocolate during 2 weeks seems to be a direct way to reduce stress in females (Al Sunni & Latif, 2014).

CONCLUSION

In conclusion, the study shows that most teenagers eat chocolate, according to 99.4 percent of the volunteer population. Additionally, chocolate consumption has a significant role in stress reduction of secondary school students; however, the significant number in this study is quite low, which means chocolate consumption slightly affects stress levels. Focusing on each gender, it is evident that females tend to have more stress than males, as the number has shown previously. Different grades have different stress levels. Nevertheless, this study could be further improved by expanding the age demographic of the survey takers to not only cover teenagers but also young adults, as well as increasing the radius of the survey region to cover more people.

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