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## **Effects of Chocolate on a Person's Immediate Mood**

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*The following presents a study of chocolate and its effect on a person's immediate mood. Prior research has suggested that chocolate affects a person biologically through neurotransmitters in the brain which can lead to an elevation in a person's mood. Our study hopes to take this evidence a step further and discover if chocolate can alter one's mood immediately, or if the chemicals in chocolate are released gradually, taking longer to affect a person's mood. The participants were mainly recruited through the Human Subject Pool at Lindenwood University and were administered two surveys: one before a treat was consumed, and one following consumption. Our results however, did not support our hypothesis suggesting that chocolate's mood elevating characteristics take time and that the variability of a person's mood is quite extensive.*

The following study involves an examination of the effects that chocolate might have on a person's immediate mood. We have all heard of chocolate referred to as an aphrodisiac or the "happy candy," but how does one validate such conjectures other than simply noting that a tasty treat makes a person happy? Current research suggests that the sugar in chocolate helps stimulate the production of serotonin, a chemical in our brain. With more serotonin comes relaxation, calmness and feelings of pleasure and euphoria. That must be why we like it so much (Romaniw, 2006). It has also been suggested that Chocolate has a chemical similar to adrenaline and a little caffeine. Together, this causes

a slight raise in heart rate and blood pressure (Romaniw, 2006). Perhaps this is what some describe as the ‘mental lift’ they feel after eating chocolate.

So it seems possible that such a ‘mental lift’ might be beneficial for a person suffering from stress at work, or a person that opts for a piece of chocolate to prepare him or herself for an important speech. Also, Covaleski (2004) states that Chocolate can affect the brain by causing the release of certain neurotransmitters. Neurotransmitters are the molecules that transmit signals between neurons. The amounts of particular neurotransmitters we have at any given time can have a great impact on our mood. Covaleski (2004) goes on to assert that chocolate includes the neurotransmitter, phenylethylamine: “This so-called ‘chocolate amphetamine’ causes changes in blood pressure and blood-sugar levels leading to feelings of excitement and alertness” (p. 1). And Andrew Drewnowski of the University of Michigan (2005) states that eating chocolate causes the brain to produce natural opiates, which dull pain and increase a feeling of well-being.

One of the British Broadcasting Company’s topics in Science and Nature offers suggestions on how chocolate makes you happy: Chocolate contains a natural love drug (Small, 2001). Tryptophan is a chemical that the brain uses to make a neurotransmitter called serotonin. High levels of serotonin can produce feelings of elation, even ecstasy, hence the name of the designer drug that also enhances the brain’s level of serotonin (Why chocolate makes us feel good 2006). Whether it be serotonin, tryptophan, opioids, or other neurotransmitters, it is has been suggested time and time again that chocolate biologically affects its consumer. For some reason, eating chocolate often puts a smile on

one's face. But our question is, how long does it take for the chemicals in chocolate to react with a person's brain in order for the person to reach this so-called euphoria?

Prior research has obviously shown that chocolate has a biological effect on the brain and a person's mood, but little evidence suggests an immediate change in a person's disposition. In our study we hypothesized that a person's mood might be immediately altered by consuming a piece of chocolate. We offered a pre-chocolate survey to the participant to gauge their initial mood. Following the survey, the participant was given a small portion of chocolate to consume within five minutes, and then received a post-chocolate survey to ascertain if their mood was significantly enhanced. The order the surveys were counterbalanced to avoid order effect and another non-chocolate candy was also administered to participants as a control variable. If our hypothesis had been supported, the guilt of eating chocolate might be overshadowed by its therapeutic or mood enhancing effects.

## **Method**

### *Participants*

Our participants consisted of volunteers from the Human Subject Pool at Lindenwood University and some acquaintances known by the researchers. We had a total of 22 participants, with eight being acquainted with the researchers, and 14 from the Human Subject Pool. Ages ranged from 18 to 48. We recruited the participants from the HSP with a small description of our study explaining the use of candy and surveys. After completing our study, those students were then rewarded with extra credit in one of their introductory social science courses. The majority of our participants resides in the St.

Charles County area in Missouri and were mainly undergraduates. In our experiment, we did not require the participants to provide information regarding their current residence with the assumption that the results gained from our study were for the most part universally biological, and hence are not related to the social or ethnic background of the participant. The small amount of participants that were acquainted with the researchers, were used to increase the sample size and to create a pool of participants that were not solely students. These participants were males and females living in the St. Charles, Missouri area.

### *Materials*

The materials used consisted of purchased Hershey's Kisses® and Starburst® fruit chews. Writing utensils were also supplied to participants if necessary in order to complete our two short surveys. Both surveys (see Appendices A and B) were designed to gauge the participant's immediate mood. Both of the surveys were essentially the same, but worded differently in an attempt to keep the participants interested by avoiding the administration of the same survey twice. The use of Starburst® pieces in this experiment was used to create a control group, therefore avoiding the placebo effect. Also, in order to avoid order effect, The order of each survey was counterbalanced as follows: Survey A → chocolate → Survey B; Survey B → chocolate → Survey A; Survey A → Starburst → Survey B; Survey B → Starburst → Survey A. Participants were randomly assigned to one of the preceding groups in order to collect our data.

### *Procedure*

The study began by informing each participant of his or her right to provide consent or choose not to participate in the study. The participants were then instructed by the researcher to fill out a small survey regarding their mood. Following the survey, the participant either received a Hershey's Kiss® or a Starburst® fruit chew. The participants were then given five minutes to consume their treat. Following the consumption of the treat, the participants were asked to fill out another survey similar to the first, but not the same, to gauge their "post-treat" mood.

If the participants receiving chocolate showed significant increases in mood in comparison with those receiving starburst, then the data would support our hypothesis; this however, was not the case. The surveys were in an agree/disagree format with four options (strongly agree, agree, disagree, or strongly disagree) we scored positively or negatively according to the wording of the question. For example, if a question read "I feel like my life is on the right track," we scored the participant with a 4 for strongly agree, 3 for agree, 2 for disagree, or 1 for strongly disagree. If a question was worded negatively such as "When I get into a dark mood, nothing can make me laugh," the scoring was reversed. Also, each survey had a different number of questions, so our data was represented as percentages in which we took the participant's total score and divided it by the total number of questions for each survey. Following the procedure, the participants received a feedback letter stating the purpose of our study.

## Results

It may be true that chocolate has a positive effect on a person's mood, but according to our research, there is little evidence to support our hypothesis that chocolate affects a person's immediate mood. We analyzed our data using the Statistical Package for the Social Sciences (SPSS) and used an independent t-test to quantify our results. According to our data, the only significance our experiment was able to uncover, was that participants scored significantly higher on survey A in comparison with survey B. This is also taking into account the counterbalancing of the order of each survey. Out of all the participants surveyed, only three scored higher on the B survey, and three had equivalent scores on both surveys.

The majority of the participants' scores fell between  $-.02$  to  $.07$ , and this remained constant regardless of the sequence of the surveys administered, or which treat the participants received. This might suggest that the treat and survey sequence we assigned to the participants did not matter, or the survey results were in regard to and affected by the present mood and outlook of each participant.

## Discussion

The majority of our data showed no significant difference in the effects of the two different treats the subjects were given between surveys. We thought the score difference between the two surveys had something to do with the participants growing tired of answering survey questions which may have been the cause of some negative difference scores. However out of all twenty-two subjects, only three participants had higher percentage scores on their B-survey than their A-survey. There were three other

participants whose percentage scores were the same on both surveys. Otherwise, every participant other than these six scored a higher percentage score on the A-survey regardless of what treat they ate or in what sequence their surveys were given.

Chocolate contains many ingredients and since we used a Hershey's Kiss, there can only be so much of each ingredient in the bite-size treat. One issue that came up while conducting the experiment was the amount of chocolate we were testing on the chocolate-eating participants. It is possible that to realistically test our hypothesis, we would need to supply a larger piece or amount of chocolate to the participant we were testing; and also the starburst for that matter. If we were to increase the amount of the chemicals being tested in chocolate by supplying a larger amount of chocolate to the participants, we would need to do the same for those who were given starburst, so as to equal the treat variable. This was one of our limitations. For those intending on conducting similar studies, we would suggest that the researcher use greater amounts of the treats in order to obtain accurate results with a greater significance.

The majority of the participants who participated in our study were Lindenwood University students. The times in which the study was available for students to participate were right around lunch time during the business week, varying between the hours of 11:00 a.m. and 1:30 p.m. This time caused many of our subjects to be in a rush as they took our study. Some of the students also were rushing to get to a class on time. Therefore, the participants may not have spent an adequate amount of time to reflect on each question on the surveys. Maybe chocolate takes more than a few minutes to have



any effect on a person's mood chemically; it is possible that the subjects' moods were elevated after they left our experiment but by then it was too late for us to test their mood.

Another limitation was that since many of our subjects were recruited from the Human Subject Pool, they were participating in our study to receive bonus points in their various classes. Since they receive these bonus points without being required to complete the experiment, they could have simply signed their names and left, leaving us with no data. Many of these students might not have a high level of interest in our experiment but just came in to receive bonus points. Therefore, some of their survey answers could have been thoughtless or skewed.

As experimenters, we have no control over the mood a person might be in when they take part in our study. Therefore, the chemicals in a small piece of chocolate might not be powerful enough to actually increase or elevate a person's mood. To enhance this experiment, one might research the amount of each ingredient in chocolate (and also in starburst) to see how much of each is needed to have a mood-changing effect on a person. Also, one might schedule their participants to come in for a greater amount of time than the experimenter needs so there is adequate time for the study taking place, and then there would be no reason for the participant to be in a hurry. Further research may also be necessary to find the amount of time that the ingredients in chocolate take for any chemical changes to have an effect.

The final limitation is in regards to the number of questions on each of the survey. Survey A had 13 questions, while survey B only had 10. What is most interesting about this limitation is the fact that the majority of our participants actually scored higher on the

survey with more questions. This leads us to suggest that the wording of survey A was significantly more positive than that of survey B. The answers could also be affected by the personality of the subjects. We as experimenters do not have control over these variables, especially since the participants come in voluntarily and for a short period of time. Overall, we found no significant data to support our original hypothesis.

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## Appendix A

### Survey A

Please place an X on the line you feel most closely resembles your own belief.

1. I feel like my life is on the right track  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
2. I am proud of who I am  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
3. When I get into a dark mood nothing can make me laugh  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
4. I often have a smile on my face.  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
5. I have a long list of things I feel grateful for  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
6. I often feel worthless  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree

7. On the whole, I am satisfied with myself

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

8. My relationships with other people are fulfilling

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

9. I often don't have reason to be thankful

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

10. I know things are going to continue to get better

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

11. I like myself

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

12. Sometimes I find myself in a bad mood for no reason and I can't shake it.

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

13. I laugh often

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

## Appendix B

### Survey B

Please Place an X on the line you feel most closely resembles your own belief.

1. I feel like my life is in an upward trend  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
2. I don't laugh much  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
3. Stress isn't hard for me to overcome  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
4. I don't offer much to those around me  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
5. I am proud to be the person I am  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
  
6. When I'm in a bad mood, it's hard to make me laugh  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree

7. Things probably won't ever get better  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
8. I do not benefit much from my relationships with other people  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
9. I hate it when people tell me to smile more  
 Strongly Agree  
 Agree  
 Disagree  
 Strongly Disagree
10. How happy do you feel you are relative to other people?  
 Much Less Happy  
 A Little Less Happy  
 A Little More Happy  
 Much More Happy