

Influence of Cognitive Engagement on Temptation and Decision Making

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ABSTRACT

The purpose of this study is to determine students' heightened susceptibility to temptation when cognitively engaged. Cognitively straining tasks require considerable focus, which inhibits the brain from the ability to effectively multi-task (Molfese et al., 2006). This may reduce the capacity for executive control during such engagement. This hypothesis was evaluated by offering participants an unhealthy (chocolate) or healthy (celery) food option during a memorization task (experimental group) or following a memorization task (control group). In the experimental group, students are cognitively engaged at the moment of the choice. This allows for the study to compare decision-making between the experimental and control group. Participants required to make a decision while actively participating in the memorization task chose the chocolate option significantly more often than participants who were offered the food after they had disengaged from the cognitive strain. This study could provide insight into how susceptible to temptation students are while under mental strain. It was hypothesized that as students are participating in a cognitively engaging task similar to studying, they will be more susceptible to choosing an unhealthy sugary snack rather than a healthier option. The data supported the idea that students who are cognitively engaged will be more susceptible to this temptation.

KEYWORDS: study habits, temptation, multitasking, food choices, memorization, decision making

INTRODUCTION

Students have been searching for the most successful study techniques for years. It is presently understood that there is no single study habit that can be credited as the best strategy, but rather there are numerous different factors that may play a role in the efficiency of a study session (Hammonds & Mariano, 2015). By maximizing the use of positive study behaviors and minimizing the negative effects of poor study habits, one can significantly increase productivity. In order to enhance a student's productivity and adeptness, it is important to break down precisely which habits may be hindering the student the most. Even the smallest changes in routine can have a significant impact on efficiency, as shown by Illahi and Khandai in their study of academic achievements and study habits in the Distract of Pulwama (2015). A 2011 study by Shai Danziger reviewing parole decisions made by Israeli judges provides support for the idea that brain engagement or distraction may modulate decision-making capabilities (Danziger, 2011). This study revealed that while the judges were distracted with biological needs (hunger), their decision-making processes were impacted and the number of paroles granted drastically decreased. When the brain is preoccupied or unfocused on the decision at hand due to other considerations, the choices made are not consistent with those made while the brain is completely undistracted and attentive to the present dilemma (Danziger, 2011). This concept is comparable to that of the food choices students make while cognitively engaged in a task such as studying.

While studying, students can increase efficiency by placing themselves in the best learning environment possible. This includes optimizing their brain and body's ability to function. Eating unhealthy foods, such as sugary snacks, can give a sudden energy boost and can be very appealing for long study sessions. Unfortunately, what many students fail to recognize is the simple sugars do not remain in the bloodstream for long, leading to a quick and sudden drop in metabolic energy (Murray, Tulloch, Criscitelli, & Avena, 2016). This influx of sugar in the blood stream can come from sugary snacks, soda, and numerous other popular study foods and drinks. This study evaluates a person's susceptibility to the

temptation of these sugary snacks while the brain is cognitively occupied and engaged.

Consumption of food during studying is quite common among undergraduate students, but the nutritional content of the food consumed before and throughout a study session can greatly influence productivity (Molteni et al., 2002). The brain is engaged and cognitively strained during this time, potentially causing students to ineffectively evaluate food choices when prompted with both healthy and unhealthy options. Consumption of sugar and unhealthy foods can inhibit the brain's ability to study effectively and retain information efficiently (Molteni et al., 2002). Students may be placing themselves at a disadvantage by not understanding the risks present with cognitive engagement and decision making. These studies have been used to better comprehend each concept individually, in order to create a superior understanding of the interaction of these ideas as a whole. Consuming sugar can reduce the brain-derived neurotrophic factor, which plays a crucial role in the brain's ability to retain information. While studying, reading, or note-taking, the brain is engaged in a task that requires significant concentration. These cognitively straining tasks require substantial focus, preventing the mind from effectively multi-tasking (Molfese et al., 2006). Multi-tasking is a cause of cognitive strain, providing a comparison to the concept of a student being cognitively engaged when making decisions. Comprehending this concept can help students better understand the problems associated with decision making, specifically food choices, while cognitively engaged in memorization during a study session.

It is important to decipher the negative effects that these poor decisions and temptations may have on brain functioning and productivity during studying. Many researchers have delved into the impact that unhealthy foods, such as the sugar that is present in the Hershey's Chocolate Kiss used in this study, have on the brain (Molteni et al., 2002). These unhealthy sugary foods decrease students' ability to form new memories, primarily due to the decreased production of brain-derived neurotrophic factor (Molteni et al., 2002).

The purpose of this study is to determine students' susceptibility to temptation when cognitively engaged, and how this may inhibit

productivity. Temptation results in students’ desire to do something potentially unwise. This allows for students to be assessed on their decision-making abilities while actively focusing on a cognitively straining task. The celery in the study represents the healthier food option, which will optimize brain capabilities, and the Hershey’s Chocolate Kiss represents an unhealthy sugary option that affects productivity by inhibiting memorization. It was hypothesized that as students are participating in a cognitively engaging task similar to studying, they will be more susceptible to choosing an unhealthy sugary snack rather than a healthier option.

METHODOLOGY

As Friese, Hofmann, and Wanke studied in 2010, the methodology was devised to mimic active cognitive engagement as a student would find themselves during a study session. Eighty participants were recruited within a library on a university campus. All subjects were undergraduate students and were recruited via a poster and informational flyers that outlined the purpose of the study outside of the study room in a heavily populated section of the library. No incentive was given to recruit students. The study/interaction took place within a private room between 12:00 p.m. and 4:00 p.m. inside the library to maintain consistency and privacy during the experiment. Subjects were presented with an information sheet and consent form to complete before participating in the experiment. The experiment was limited to only one subject taking part in the study at a time to preclude any outside influence. Subjects were randomly assigned prior to their participation via alternating between the control and experimental group.

Participants in the experimental group (40 subjects) were required to memorize a randomized six-digit numerical code, which was unique to each subject, for 60 seconds. Precisely 30 seconds after initially being given the memorization task, the subject was prompted with the choice between a single Hershey’s Chocolate Kiss and a single stick of celery. The stick of celery was the healthy food choice and the Hershey’s Kiss was the less healthy alternative. The subjects, following the food decision, completed the 60-second memorization task and, to the best of their ability, repeated the six-digit code back to the researcher. The subject’s choice of food during the study was recorded by the researcher.

The control group (40 subjects) was likewise required to memorize a six-digit code for 60 seconds. They too were required to repeat, to the best of their ability, the six-digit code back to the researcher following the 60 seconds. The control group subjects, however, were only prompted with the food option (Hershey’s Kiss or a stick of celery) after their participation in the memorization task. This time, the food proposal was after the subjects had repeated the six-digit code back to the researcher, disengaging them from the cognitive strain that the experimental group subjects faced during their food decision. Again, the subject’s choice of food during the study was recorded by the researcher.

RESULTS

In order to effectively analyze the data gathered, a chi-squared goodness of fit test was performed to determine whether there was a significant difference between the control and experimental groups’ food choices within the study. The alpha level of significance was set at .05 and the degree of freedom used was 1.

The memorization task, which induced cognitive strain, had a significant effect on the decision-making process in regard to healthy versus unhealthy food choices (Figure 1). Participants required to make a decision while actively participating in the memorization task (experimental group) chose the chocolate option

significantly more often than the participants who were offered the food after they had been disengaged from the cognitive strain (control group). When participants were offered food during the memorization task, they chose the celery (healthy option) just 17.5% of the time compared to the 40% of participants who were offered food after the memorization task (Table 1). A chi-squared goodness of fit test determined that the chi-square statistic was 4.943 with 1 degree of freedom and an alpha level of significance set to be evaluated at .05. This chi-squared value of $\chi^2 = 4.943$ falls at roughly the .025 level of significance ($p < .05$).

DISCUSSION

The participants who were presented with the celery and chocolate during the memorization task chose the chocolate significantly more often than the participants who were presented with the food selection after the memorization task. The data supported the idea that as students are engaged cognitively, they will be more susceptible to the temptation of choosing an unhealthy snack. This concept agrees with Danziger’s study on the impact that reduced cognitive awareness has on decision making. Danziger supported the idea that it is imperative to be conscious of one’s cognitive strain in order to make thoughtful and careful decisions in any aspect of life (2011). That idea plays an important role in the impact this study can have on a student’s productivity. An alternate explanation could reside in the students’ satisfaction of having successfully memorized the six-digit code, relieving them of a desire or craving for the pleasure of chocolate.

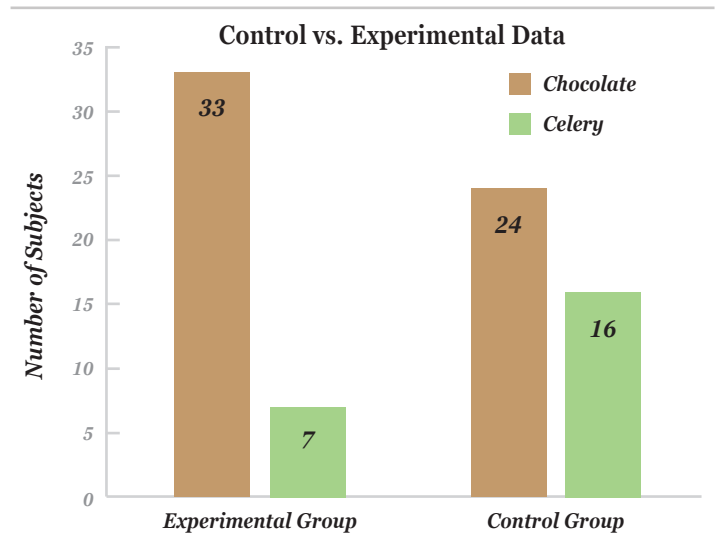


Figure 1. A side-by-side view of the control and experimental groups’ amount of chocolate and celery chosen in order to efficiently compare the differences in data.

Table 1. Chocolate/Celery Chosen Comparison Data

Analysis of the numbers of celery and chocolate chosen within the experimental and control groups. For the purpose of the chi-squared goodness of fit test, the control group was established as the expected outcome and the experimental group was set as the observed outcome.

| | Chocolate | Celery |
|--------------|------------|-----------|
| Control | 24 (60%) | 16 (40%) |
| Experimental | 33 (82.5%) | 7 (17.5%) |

In the future, it is important that an analysis and assessment of other various study habits that may also be hindering productivity be studied. Alongside unhealthy snacking, there are many other factors that could negatively or positively influence efficiency. Various other study habits that would be beneficial to research in a future study include listening to music, studying in a loud environment, working in a consistent location, and several others. The world is adapting to create more efficient and productive technology and ideas. Students should follow in that mindset by creating the most flawless and efficient study habits imaginable. It is imperative for a student to understand their susceptibility to temptation when under cognitive stress in order to maximize their studying efficiency. It should be noted that some limitations within this study were present. If a student prefers celery to chocolate on a gustatory as well as a rational level, that could negate the assumption that the chocolate is more tempting. In order to avoid this bias, increasing the sample size would help negate any pre-dispositioned opinions that may alter results. Also, the experimenter's presence during the study may have promoted the choice of the healthier option in order not to be seen as making poor diet choices. This influence should be avoided in future studies by implementing voice commands as opposed to the presence of the experimenter in the room with the subject.

CONCLUSION

This experiment supports the hypothesis that cognitive engagement has a significant effect on decision-making capabilities. The data supported the idea that students who are engaged cognitively will be more susceptible to the temptation of choosing an unhealthy snack. It is vital for students to be mindful of these temptations that may arise during studying due to the negative role that sugars and unhealthy foods play in the brain's ability to function at a productive rate (Murray, Tulloch, Criscitelli, & Avena, 2016). The results of this study showed the sugary, chocolate option being chosen more often than the healthy, celery option. The implications of sugar's effect within the brain are important for students to understand due to the significantly higher selection of chocolate within the study. It is essential for students to optimize their productivity in a work environment, and this study provides evidence that sugar and unhealthy foods may be hindering that work efficiency due to the negative effects that sugar has on memorization.

Limitations of this study include the potential for the choice between celery and chocolate being reflective of an individual's personal preference rather than an indication of one's decision-making capabilities. Further studies should elaborate on the idea of a "bad decision" and a "good decision" in regard to the methodology. Not all individuals consider chocolate to be a bad decision, just as not all individuals consider celery to be a good decision. This assumption was made within this study as an example of a general consensus and the study could be extended to include other socially recognized good and bad decisions. In future studies, it is important to negate the influence the experimenter's presence carries while the subject makes the food choice. Societal norms promote healthy eating, which one may be more susceptible to do when in the presence of others who may judge their food choice.

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