I. Introduction

Our project sought to find a positive correlation between the introduction of choice of snack during study group sessions and student participation and engagement. Although we did not find data regarding the specific relationship between food choice and its effect on students in our literature search, we were able to find data that demonstrated the independent correlations between food and affect, as well as choice and affect.

Kanarek and Swinney (1990) assessed the effects of food on attitudes towards learning and cognitive performance in male college students. Experiment One involved all experimental participants receiving breakfast in the lab and a snack. On two out of the four testing days, they also received lunch, producing combinations of lunch and snack or no lunch and snack. The snack was either a confectionery product or diet soda with no calories. The subjects were tested on four cognitive tasks following each condition. Results indicated that the caloric snack had a significant positive effect on task performance. Experiment Two utilized a similar design, expect subjects were given fruit flavored yogurt in place of the confectionery product as a snack. Research showed a more positive effect on cognitive performance in the yogurt condition. In sum, caloric snack intake led to increased cognitive functioning, with higher functioning associated with a healthier snack (i.e., yogurt). In a similar experiment, Benton, Slater, and Donohoe (2001) investigated the influence of breakfast and a snack on psychological functioning. There were six conditions: (1) no food consumption; (2) no breakfast but a snack; (3) 10 g of cornflakes and no snack; (4) 10 grams of cornflakes with a snack; (5) 50 grams of
cornflakes but no snack; (6) 50 grams of cornflakes and a snack. The participants were given a memory task and a mood assessment within each condition. Subjects who ate a snack showed a mood improvement, while those who only received breakfast exhibited no mood improvement.

Flowerday and Schraw (2003) examined the effect of choice on cognitive performance and affect by assessing the consequences of the presence or absence of choice on material to be learned. The first of two groups of participants had a choice between writing an essay or solving a crossword puzzle. The second group, in contrast, did not have a choice and was assigned one of the previously mentioned tasks. In the second portion of the experiment, one group was given a choice in the amount of time they needed to study, while the second group's time allotted for studying was determined by the researchers. In both experiments, attitude, affect, and effort exhibited a positive trend following choice implementation. In accordance with the previous study, Schraw, Flowerday, and Reisetter (1998) studied the effects of student choice on academic performance. 164 undergraduates were randomly assigned to either a denied-choice or a choice condition. Undergraduates in the choice condition selected a narrative to read based on a one sentence description. Attitudinal measures indicated that undergraduates favored the choice over the denied choice conditions; these undergraduates scored higher when given a choice about the academic activity.

Using the results, our group attempted to bridge the two sections of literature on food and choice in order to find a positive association between choice of snack and engagement in study group. We hypothesized that the presence of a choice in snack during the study group would increase participation in the form of more questions asked.

II. Methods

We sampled 14 undergraduate students across two study groups (Group One = 5 students,
and Group Two = 9 students). All participants were fairly regular members of our study groups. Students were exposed to four conditions over a four-week period: no snack, a healthy snack only, an unhealthy snack only, and a choice between healthy and unhealthy snack. The study group leaders introduced the snacks to the students in a nonchalant and inconspicuous way. Food was presented at the center of the table at the start of each of four study group sessions. Students could consume food at their leisure and were not influenced to select a snack.

In each of the four conditions, the study group leaders recorded the total number of questions asked throughout the hour long session. We thought this the most effective measure of participation and engagement. We did not want to put undue pressure on the students by giving them quizzes to measure engagement during the session, as study groups are conducted in a voluntary setting. We discounted clarification questions or questions regarding the exam format or assignments; only questions directly relating to the material being discussed were included. To ensure that the total number of questions was not influenced by the difficulty of the material presented each week, the study group leaders administered the experimental conditions during the same four weeks. This prevented the potential effect of more difficult material eliciting more questions from students.

### III. Results

<table>
<thead>
<tr>
<th>Condition</th>
<th>Group One</th>
<th>Group Two</th>
<th>Group One + Two</th>
<th>Mean Questions Asked</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Snack</td>
<td>9</td>
<td>6</td>
<td>15</td>
<td>7.5</td>
</tr>
<tr>
<td>Healthy Only</td>
<td>8</td>
<td>6</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Unhealthy Only</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Healthy + Unhealthy/Choice</td>
<td>9</td>
<td>10</td>
<td>19</td>
<td>9.5</td>
</tr>
</tbody>
</table>
IV. Discussion

The results of our experiment confirm our hypothesis regarding the additive impact of food and choice on study group member involvement. Statistical analysis indicated that the total number of questions asked by students across the two study groups was significantly greater in the choice condition than the total number asked in the other three conditions. This finding suggests that the element of choice, in conjunction with the presentation of a snack, influences the level of student interest and subsequent engagement in study group. Our results also coincide with the literature, particularly that on the topic of choice in the academic setting. Flowerday and Schraw (2003), for instance, found that allowing subjects to choose their task during the experiment led to a positive trend in the areas of attitude, affect, and effort. Similarly, with the introduction of choice of snack in our study groups, we found more student participation in the form of more questions asked. We cannot safely conclude, however, that our research replicates previous findings such as those of Flowerday and Schraw (2003), as none of the studies we read examined the effects of both food and choice on student participation within a single study.

Interestingly, analysis of the relationship between the healthy and unhealthy snack conditions showed no significant difference between the two conditions, which somewhat contradicts our initial predictions. We assumed that the healthy snack condition would yield significantly more questions than would the unhealthy snack condition, as healthy food presumably promotes better cognitive performance. However, we realized that our experiment was a test of investment in and attitude towards learning as opposed to cognitive or academic performance. We did not administer diagnostic quizzes to assess the students' understanding of the material; instead, we used a measure that looks at students' level of interest in the subject matter: the number of questions asked per session. The lack of difference between the healthy
and unhealthy snack conditions led us to the conclusion that the quality of the snack may not impact attitudes towards learning. The most important component involved, then, may be students' perception of control and personal volition.

We have several suggestions concerning future research on the influence of choice of food on student engagement. A fundamental limitation of our study concerned our sample. We, unfortunately, sampled only a finite number of individuals, many of whom irregularly attended the two study groups observed. Future researchers may want to increase the sample size and include only those participants who were subject to all four conditions. If one were to use a similar methodology to ours, one could use different foods from those that we presented over the course of our study. We decided on Chips Ahoy cookies as our unhealthy snack and raspberries as our healthy snack. One could replicate our study using other healthy and unhealthy snack choices (e.g., different fruits or vegetables for a healthy snack, and different cookies or candy for an unhealthy snack). Utilizing different types of food can negate a potential “food effect” in our study, in which the specific foods we used during testing may account for our results. The change can provide further validation of our results, as well as generalization of the phenomenon. Additionally, one could employ a different measure to evaluate the level of student involvement during each study group session. We felt that a record of the number of questions asked most accurately reflects the level of student engagement in the material being discussed, but other measures may certainly offer more accurate data. If a researcher wished to shift focus from student engagement to student academic/cognitive performance, he/she can use performance on weekly quizzes as an assessment tool.
References


