

The Effects of Breakfast on Private High School Students

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ABSTRACT

The US has tackled the issue of students across the globe skipping breakfast with free breakfast in K-12 public schools. ~52.3% of school-aged children get breakfast, but these numbers decrease with age, with higher rates among 12–15 year-olds, those with highly educated mothers, and those from low-income families. Private schools do not have access to free breakfast programs. This study aims to analyze the impact on students in private schools of receiving subsidized breakfast through PTO-operated concession stands. Participants were tested over a week, split between those given access to breakfast and those given no breakfast, and measured on self-assessed levels of hunger, mood, energy, and focus. The second week, the no-breakfast group was split into two groups and mimicked free breakfast programs found in public schools to analyze the effectiveness of this program in private schools. Chi-square and Fisher's exact tests were applied to the intervention data, and only one comparison (pre-lunch hunger in Week 2) reached statistical significance. Due to the self-reported nature of the outcome measures and the limited sample sizes across phases ($n = 118$ survey respondents; $n = 46$ Week 1; $n = 18$ Week 2), findings should be interpreted as preliminary and descriptive rather than conclusive.

LITERATURE REVIEW

Introduction

In a study done by Alanna Sincovich et al., a public health researcher, "1 in 3 students reported skipping breakfast sometimes or often, and 1 in 10 reported skipping breakfast every day" (Sincovich et al., 2022). According to nutritionist Michael J. Gibney et al., "Breakfast is the first meal of the day that breaks the fast after the longest period of sleep and is consumed within 2 to 3 h of waking" (Gibney et al., 2018). The Better Health Channel, Australia's largest health and medical website, states that breakfast "improves your energy levels and ability to concentrate in the short term," and has many long-term health benefits (Breakfast, 2023). For instance, it stimulates glucose production and reduces the risk of type 2 diabetes and heart conditions (Breakfast, 2023). For this reason, breakfast is commonly considered the most important meal of the day; however, people do not treat it this way. In her study, Alanna Sincovich et al. concluded that "breakfast skipping among children and adolescents is considerably more prevalent than previous research... suggests" (Sincovich et al., 2022).

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Habits and Accessibility

Children and adolescents often have negative attitudes towards breakfast. For instance, in a study conducted by Louise Harvey-Golding et al., who obtained their PhD in psychology from Northumbria University, students reported their reasons for skipping breakfast. One student noted, "I'm up and I don't want anything to eat at 6 o'clock in the morning, so I won't," and another stated, "I just think oh I'm not hungry at the minute, I don't fancy it at the minute" (Harvey-Golding et al., 2015). Moreover, in a study done by Nancy M. Sweeney and Naomi Horishita, both registered nurses, "Sixty-four percent of breakfast-skippers cited a lack of time, and 28% stated they could not eat early in the morning" (Sweeney & Horishita, 2005). This mindset is one reason the percentage of people skipping breakfast worldwide is increasing. According to Sophie Burnell et al., masters of Public Health from the University of Adelaide, "17.4% [of students] reported sometimes skipping, 18.0% reported often skipping, and 9.5% reported always skipping breakfast" (Burnell et al., 2025). Interestingly, Burnell et al. found that females and high school seniors are more likely to skip breakfast (Burnell et al., 2025). Similarly, Sweeney and Horishita found in their study that females are more likely than males to skip breakfast (Sweeney & Horishita, 2005). They also found that "10th grade students had the highest rate of skipping breakfast" within their study (Sweeney & Horishita, 2005).

Burnell et al. also noted that students "living in socioeconomically disadvantaged... areas" have a significant rate of breakfast skipping (Burnell et al., 2025). Due to socioeconomic disadvantages, schools have implemented the School Breakfast Program (SBP). Wilton Simpsons, the Florida Commissioner of Agriculture, defines the SBP as "a federally funded program that helps participating schools provide breakfast to all students" (Simpson, 2025). To make this program more widely available, according to David Frisvold, associate professor of economics, "many states mandate that schools participate in the program if the percentage of free or reduced-price eligible students in a school exceeds a specific threshold" (Frisvold, 2014). By implementing this program throughout more schools, student achievement may increase (Frisvold, 2014).

Academics and Cognition

Due to the widespread practice of skipping breakfast, students' academic performance has been adversely affected. Inversely, breakfast is associated with educational and cognitive success. According to Katie Adolphus et al., a research fellow at the Human Appetite Research Unit at the University of Leeds' School of Psychology, "quality of habitual breakfast, in terms of providing a greater variety of food groups and adequate energy, was positively related to school performance" (Adolphus et al., 2013). Mary O. Hearst et al., who hold a PhD in Epidemiology from the University of Minnesota, found that when students eat breakfast, their cognitive abilities, focus, memory, math scores, and attendance records were associated with improvements (Hearst et al., 2016). As demonstrated, eating breakfast may support school performance in a number of ways. For instance, according to Andrew J. Martin et al., a Professor of Educational Psychology at the University of New South Wales in Australia, "breakfast consumption [predicts] higher adaptive motivation" (Martin et al., 2024). An anonymous parent stated that "[Breakfast] feeds the brain and so you know if they've not had anything to eat first thing in the morning, [they] are not

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motivated, they're sluggish" (Harvey-Golding et al., 2015). Clearly, breakfast may be an important part of the everyday routine, as without it, students risk not fulfilling their full potential in their academic surroundings.

The SBP is not only a crucial program that may improve students' nutritional status, but also gives students a chance to reach their full academic potential, just as those in higher socioeconomic classes do. Studies have suggested that when the SBP is implemented in schools, students' academic achievement increases. According to Judith S. Bartfeld et al., professor of Consumer Science, "When breakfast was offered free to all students, the probability of low attendance was 3.5 percentage points lower than with traditional SBP for a broad cross-section of students ($P < 0.001$), and math and reading scores were 0.07 and 0.04 SD higher among the higher-income sample, respectively ($P = 0.001$ and $P = 0.035$, respectively)" (Bartfeld et al., 2018).

Behavior

Just as breakfast may improve one's academic performance, it is associated with students' behavior throughout their day. According to Harvey-Golding et al., "School staff reported that children who missed their breakfast meal would typically lack energy and display detrimental behaviors such as negative mood and frustration in the classroom" (Harvey-Golding et al., 2015). An anonymous school staff member states, "The bad behavior creeps in, because they just don't know what to do and then they're not concentrating so they will have annoyed the person next to them" (Harvey-Golding et al., 2015). When students do not eat breakfast, they may exhibit disruptive behaviors; however, when they do, they tend to show more positive behaviors. According to Adolphus et al., "Adolescents who habitually consumed breakfast (>5 days/week) had significantly reduced likelihood of disruptive behavior [Odds Ratio (OR): 0.29, 95% CI: 0.15–0.55] compared with those who ate breakfast less frequently (≤ 5 times per week)" (Adolphus et al., 2013). These results demonstrate a positive association between breakfast and focused behavior in one's academic environment (Adolphus et al., 2013).

Mental Health and Overall Well-Being

Not only does breakfast affect one's life at school, but it is also associated with one's mental state. According to Tatiana Naumoska et al., who hold a master's degree in Public Health with a strong background in nutrition, studies continue to demonstrate that breakfast skipping has a relationship with "a range of health concerns, including obesity, anxiety, depression, and stress" (Naumoska et al., 2024). Naumoska et al. found that "Adolescents, defined as individuals aged 10 to 19 years, experience disproportionately high rates of anxiety and depression, with an estimated 10–20% of this population globally affected" (Naumoska et al., 2024). According to Burnell et al.'s study, "negative emotional wellbeing outcomes of sadness and worries were higher for children and adolescents who skipped breakfast every day, compared to their peers who never skipped breakfast" (Burnell et al., 2025). Moreover, students who eat breakfast reported higher levels of "happiness, optimism, and life satisfaction" (Burnell et al., 2025). Evidently, breakfast may affect one not only in the school environment but also in one's mental health and overall well-being.

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GAP IN LITERATURE

This research aims to identify the relationship between high school students' breakfast consumption and its impact on their lives. A notable gap in the existing literature is the lack of studies analyzing the relationship between breakfast consumption and high school students specifically at private schools, particularly in South Florida. Most prior research has been conducted in public school settings where breakfast programs are federally funded and widely implemented; the private school context presents distinct socioeconomic and logistical factors that may influence breakfast habits differently. Because private school students do not have access to programs such as the SBP, which Bartfeld et al. (2018) associated with improved attendance and higher math and reading scores, or to the structured breakfast environments described by Harvey-Golding et al. (2015), the energy, mood, and focus differences documented among breakfast-skipping students in public school research may be similarly present, or even more pronounced, among private school students who skip breakfast without any comparable institutional support in place. Although the implementation of the SBP in public schools provides all students with equal opportunities to reach their potential, the program is not available in private schools and does not account for voluntary skipping of breakfast. These factors are essential to identify, as offering private school students complimentary or charged breakfast at school could affect how they behave throughout the school day and in their everyday lives.

HYPOTHESIS

My hypothesis is that students who skip breakfast will be less focused and energized and in a worse mood throughout the class periods leading up to lunch. Conversely, students who eat breakfast will be more focused and energized and have a more positive mood. Moreover, I hypothesize that on days when breakfast is offered to students, students who do not usually eat breakfast will eat it, and that this change in routine will be associated with improvements in their focus, energy, and mood throughout the day.

METHODS

This study employed a mixed-methods research design to explore both the qualitative and quantitative results. The researcher aimed to obtain numerical data using Likert scales in surveys and to present quantitative results accompanied by explanations of the corresponding responses. Both of these methods of study are crucial to include in the experiment, as the researcher needs to know the exact results and why people felt that way. Before each respondent answered the survey questions, they were notified that their responses would be used anonymously for research purposes and that they had the option to decline to participate. It is important to note that findings from the initial survey (Phase 1) are descriptive only, as that phase captured a single time point per respondent. For the Week 1 and Week 2 intervention phases, chi-square tests were applied to the pooled hunger, fatigue, and focus data to evaluate whether observed differences between groups exceeded what would be expected by chance; results are reported alongside each figure in the Results section below.

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Statistical Analysis

For each intervention week, hunger, fatigue, and focus ratings were collapsed into binary low/high categories and compared between groups using a chi-square test of independence, with Fisher's exact test reported as well given the small samples involved. Because the underlying data consist of repeated daily reports collected from the same students across a one-week period rather than a single independent observation per student, these reports are not fully independent of one another. This means the tests below should be interpreted as descriptive checks on the pooled daily data rather than as fully independent-samples inferential tests, and the resulting p-values likely understate the true uncertainty in the estimates. Phase 1 survey data, which reflect one time point per respondent across five self-selected breakfast groups, are presented descriptively as percentages without formal significance testing, consistent with that phase's exploratory purpose of characterizing breakfast habits rather than testing a specific hypothesis.

Outcome Measures and Likert Scales

All primary outcome measures were assessed using Likert-scale survey items administered via Google Forms. The specific scale anchors were as follows: Hunger was rated on a 5-point scale (1 = Not Hungry, 5 = Starving); Fatigue/Energy was assessed with response options ranging from Exhausted, Slightly Tired, Neutral, Mostly Energized, to Fully Energized; Mood was rated from Very Negative, Somewhat Negative, Neutral, Mostly Positive/Happy, to Very Positive/Happy; and Focus was rated on a 5-point scale (1 = Low Focus, 5 = High Focus). These scales were consistent across all phases of the study. Because all outcomes relied on self-report, they are subject to response bias and should not be interpreted as objective measures of cognitive function or academic performance.

Study Design and Participant Overview

The study was conducted in three phases. A summary of participant counts per phase is as follows: Phase 1 (Survey) included the full student body of approximately 300 students, with 118 responses received; Phase 2 (Week 1 Experiment) included 46 student participants; Phase 3 (Week 2 Experiment) included 18 student participants. The decrease in participants across phases reflects voluntary opt-in and attrition. The small sample sizes, particularly in Week 2 ($n = 18$), limit statistical power and the generalizability of findings to the broader private high school population. Demographic information including grade level, age, and sex distribution was not systematically collected, which is acknowledged as a limitation.

Phase 1: Survey

Before the experiment is explained, it is important to note that the school where the study took place

offered an optional breakfast at a concession stand every Wednesday for students to purchase. The concession stand opened at 9:30 am, and students could get breakfast before their second class.

The first phase of the study was sending a survey to private high school students in South Florida. The researcher sent out this survey to the entire student body (300 students) and received 118 responses. Respondents were asked, "What does your breakfast look like in the morning?" They received five response options: You eat breakfast at home; You eat breakfast in the car; You take a snack with you for the AM; You have only coffee or a drink; or No breakfast, snacks, or drinks. Based on their responses, each participant was directed to a different section of the survey and completed a series of questions about their morning mood, focus levels, fatigue, and hunger. The survey helped the researcher gather basic information on breakfast trends in this population, but it is insufficient to establish statistically significant correlations.

Phase 2: Week 1 Experiment

For Phase 2, the researcher separated all students who opted to participate ($n = 46$) into two groups based on their self-reported breakfast habits: those who reported eating breakfast every morning and those who did not. Group assignment in Week 1 was based on existing habits rather than random assignment. From there, the researcher sent out a form every school day for one week, and students reported their hunger levels, mood, energy, and focus throughout each day.

Phase 3: Week 2 Experiment

Phase 3 only included students who skipped breakfast every morning. The researcher aimed to randomly assign students to two groups: one that changed their breakfast habits (experimental group, ate breakfast) and one that maintained their original habits (control group, skipped breakfast). However, full randomization was not achieved, as students with health-related dietary restrictions were excluded from the experimental group, resulting in a non-random assignment. The food offered each day was chocolate chip muffins, dark chocolate sea salt Kind bars, and Nutri-Grain bars, made available at approximately 9:30 am. As in Phase 2, a form was sent out every day for a one-week period. Compliance with breakfast consumption during the intervention week was not formally verified beyond self-report.

RESULTS AND DISCUSSION

Breakfast at Home

Table 1 summarizes self-reported morning preparation time across all five breakfast groups, replacing the original individual pie charts.

Table 1

Morning Preparation Time by Breakfast Group (% of respondents)

Breakfast Group	10–20 min	20–30 min	30–40 min	1 hr+	n
Breakfast at Home	23.4%	29.8%	38.3%	8.5%	47
Breakfast in the Car	42.1%	31.6%	21.1%	5.3%	19
Snack for AM	50.0%	33.3%	16.7%	0.0%	6
Coffee/Drink Only	26.3%	68.4%	0.0%	5.3%	19
No Breakfast	37.0%	37.0%	18.5%	7.4%	27

Among students who eat breakfast at home, the majority (38.3%) reported taking 30–40 minutes to get ready, and only 23.4% took 10–20 minutes. Students who grab a snack for the AM were quickest to get ready, with 50% completing their routine in 10–20 minutes. These differences may reflect the time required to sit down for a full meal versus grabbing a portable item.

Table 2 consolidates self-reported energy levels upon arrival at school across all groups.

Table 2

Self-Reported Energy Level at School Arrival by Breakfast Group (% of respondents)

Breakfast Group	Exhausted	Slightly Tired	Neutral	Mostly Energized	Fully Energized	n
Breakfast at Home	10.6%	40.4%	25.5%	17.0%	6.4%	47
Breakfast in Car	5.3%	63.2%	5.3%	15.8%	10.5%	19
Snack for AM	0.0%	66.7%	33.3%	0.0%	0.0%	6
Coffee/Drink Only	15.8%	42.1%	15.8%	26.3%	0.0%	19
No Breakfast	25.9%	37.0%	29.6%	7.4%	0.0%	27

A clear pattern emerges across groups: students who skipped breakfast entirely reported the highest rates of exhaustion (25.9%), compared to 10.6% among those who ate at home. Students who consumed only a snack or coffee reported intermediate levels. These patterns suggest a possible association between breakfast consumption and morning energy levels, though confounding variables such as sleep duration cannot be ruled out.

Table 3 consolidates self-reported mood at school arrival across all groups.

Table 3

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Self-Reported Mood at School Arrival by Breakfast Group (% of respondents)

Breakfast Group	Very Neg.	Somewhat Neg.	Neutral	Mostly Pos.	Very Pos.	n
Breakfast at Home	4.3%	19.1%	34.0%	38.3%	4.3%	47
Breakfast in Car	0.0%	10.5%	42.1%	36.8%	10.5%	19
Snack for AM	0.0%	0.0%	83.3%	16.7%	0.0%	6
Coffee/Drink Only	0.0%	42.1%	31.6%	26.3%	0.0%	19
No Breakfast	7.4%	33.3%	44.4%	14.6%	0.0%	27

The no-breakfast group showed the highest rates of negative mood on arrival (7.4% very negative; 33.3% somewhat negative), while students who ate breakfast at home or in the car reported more positive moods. The snack group was notably neutral (83.3%), which may suggest that a small morning snack is insufficient to produce the mood benefits associated with a full breakfast.

Table 4 consolidates self-reported hunger during the C/D period (~11:00 AM) across all groups.

Table 4

Self-Reported Hunger During C/D Period (~11:00 AM) by Breakfast Group (% of respondents)

Breakfast Group	Not Hungry	Somewhat Hungry	Very Hungry	n
Breakfast at Home	4.3%	66.0%	29.8%	47
Breakfast in Car	5.3%	68.4%	26.3%	19
Snack for AM	0.0%	83.3%	16.7%	6
Coffee/Drink Only	10.5%	42.1%	47.4%	19
No Breakfast	7.4%	51.9%	40.7%	27

Across all groups, the majority of students reported some degree of hunger by the C/D period, regardless of whether they had eaten breakfast. Notably, the "Not Hungry" percentages are similarly low across groups, even the breakfast-at-home group had only 4.3% reporting no hunger. An anonymous student stated, "When I'm hungry, I tend to feel irritated or tired, which can make [school] more stressful." This suggests that breakfast consumed before school, regardless of form, may be insufficient to sustain students through the late morning period.

Table 5 consolidates self-reported changes in energy and mood after lunch across groups. The Snack for AM group reported no change in energy or mood after lunch and is excluded from this table.

Table 5

Self-Reported Changes in Energy and Mood After Lunch by Breakfast Group (% of respondents)

Group	Less Energy	Same Energy	More Energy	Less Happy	Same Mood	Happier	n
Breakfast at Home	19.1%	23.4%	57.4%	6.4%	29.8%	63.8%	47
Breakfast in Car	42.1%	15.8%	42.1%	0.0%	31.6%	68.4%	19
Coffee/Drink Only	21.1%	26.3%	52.6%	26.3%	0.0%	73.7%	19
No Breakfast	11.1%	37.0%	51.9%	3.7%	40.7%	55.6%	27

Across all groups, a majority of students reported feeling more energized and happier after lunch, suggesting that midday food intake is associated with positive shifts in self-reported wellbeing regardless of morning eating habits. The coffee/drink-only group showed the largest mood boost (73.7% happier), likely reflecting a greater contrast from their more negative pre-lunch baseline.

Reasons for Skipping Breakfast

Students in the coffee/drink-only and no-breakfast groups were asked why they do not eat breakfast in the morning. Figures 1 and 2 below display the results for each group respectively. Across both groups, lack of time and not feeling hungry were the most commonly cited reasons. Stomach discomfort and stress-related factors were less common but present in both groups.

Figure 1. Reasons for skipping breakfast: Coffee/Drink Only group.

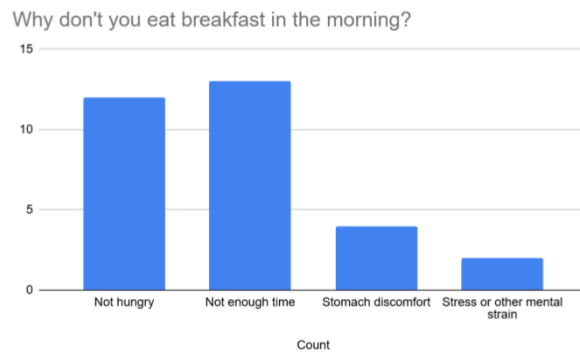
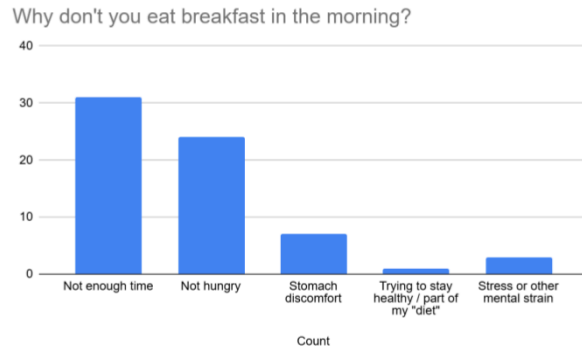


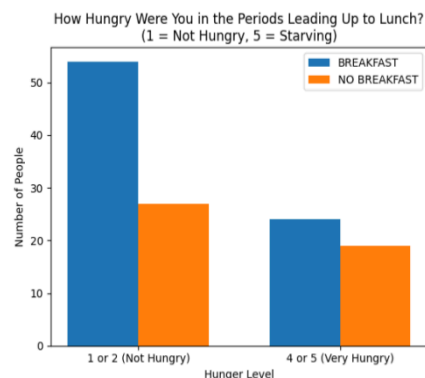
Figure 2. Reasons for skipping breakfast: No Breakfast group.



Experiment Week 1

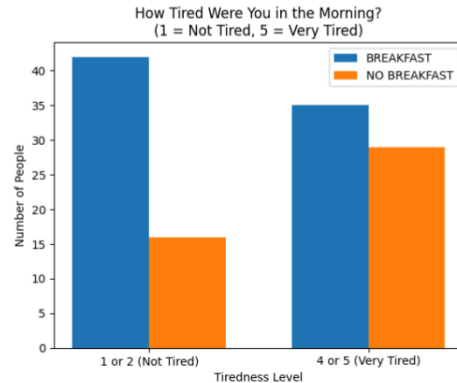
Figures 3, 4, and 5 display the results of Week 1 of the experiment ($n = 46$), comparing students who ate breakfast with those who did not across hunger, fatigue, and focus.

Figure 3. Week 1 Hunger Levels



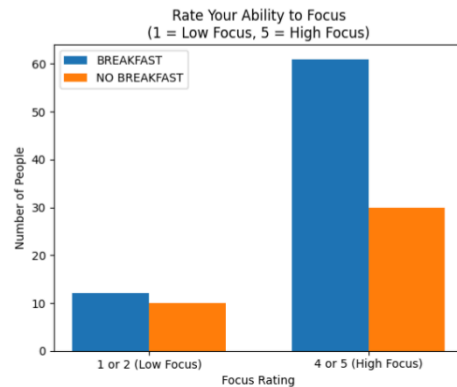
Among respondents who ate breakfast, 54 reports indicated low hunger throughout the morning, while 24 indicated high hunger. Among those who did not eat breakfast, 27 indicated low hunger and 19 indicated high hunger. A chi-square test found no statistically significant association between breakfast consumption and pre-lunch hunger level in Week 1, $p = .320$ (Fisher's exact $p = .248$). These descriptive patterns suggest a possible association between eating breakfast before school and reduced pre-lunch hunger, but the difference was not statistically significant in this sample, and given the repeated-measures nature of the pooled daily reports, this result should be treated as exploratory rather than confirmatory.

Figure 4. Week 1 Fatigue Levels



In the breakfast group, 42 reports indicated feeling mostly awake, while 35 indicated exhaustion. In the no-breakfast group, 16 indicated feeling mostly awake and 29 indicated exhaustion. A chi-square test approached but did not reach conventional significance, $p = .066$ (Fisher's exact $p = .060$). These patterns suggest a possible association between breakfast consumption and morning wakefulness that may warrant further investigation with a larger, independent sample, though confounding factors such as sleep duration were not controlled for.

Figure 5. Week 1 Ability to Focus



In the breakfast group, 12 reports indicated low focus and 61 indicated high focus. In the no-breakfast group, 10 indicated low focus and 30 indicated high focus. A chi-square test of independence found no statistically significant association between breakfast consumption and focus level in Week 1, $p = .395$ (Fisher's exact $p = .323$). While the breakfast group showed a higher proportion of high-focus reports numerically, this difference was not statistically significant, and the results should be interpreted descriptively.

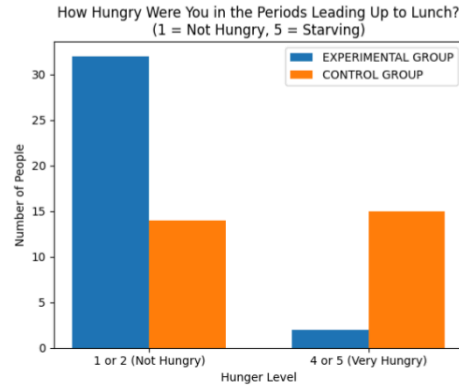
Experiment Week 2

Figures 6, 7, and 8 display the results from Week 2 ($n = 18$), comparing the experimental group (ate breakfast ~9:30 am) with the control group (continued skipping breakfast).

Figure 6. Week 2 Hunger Levels

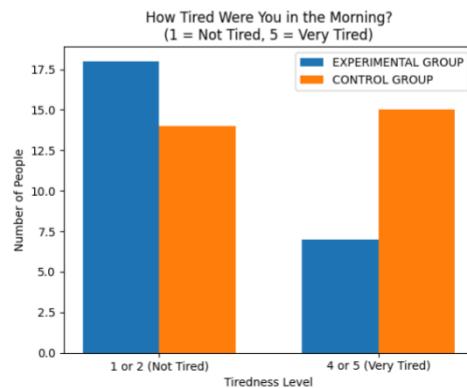
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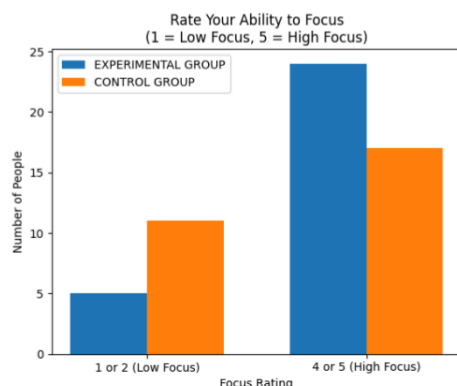
In the experimental group, 32 reports indicated low hunger before lunch, while only 2 indicated high hunger. The control group was more evenly split: 14 indicated low hunger and 15 indicated high hunger. A chi-square test found a statistically significant association between group assignment and pre-lunch hunger level in Week 2, $p < .001$ (Fisher's exact $p < .001$). This was the only outcome across either intervention week to reach conventional statistical significance, and it suggests that the timing of breakfast (closer to the mid-morning period at 9:30 am) may be particularly relevant in reducing pre-lunch hunger. However, given the small sample ($n = 18$), the non-random assignment in Week 2, and the repeated-measures structure of the pooled daily data, this finding should still be treated as preliminary and interpreted with caution rather than as definitive evidence of a causal effect.

Figure 7. Week 2 Fatigue Levels



In the experimental group, 18 reports indicated feeling fully awake and 7 indicated feeling very tired. In the control group, 14 indicated feeling awake and 15 indicated exhaustion. A chi-square test found no statistically significant association between group assignment and fatigue level, $p = .136$ (Fisher's exact $p = .100$). Students in the experimental group were numerically more likely to report feeling awake, while control group students were more likely to report feeling very tired, but this difference did not reach statistical significance in this small sample.

Figure 8. Week 2 Ability to Focus



In the experimental group, only 5 reports indicated low focus while 24 indicated high focus. In the control group, 11 indicated low focus and 17 indicated high focus. A chi-square test found no statistically significant association between group assignment and focus level, $p = .120$ (Fisher's exact $p = .082$). These patterns are numerically consistent with the idea that a mid-morning breakfast may be associated with improved alertness and concentration, but the small sample size ($n = 18$) and the absence of a statistically significant result limit the strength of any conclusions drawn.

CONCLUSION

Taken together, the results from this study suggest that eating breakfast is associated with reduced morning hunger, lower rates of self-reported fatigue, and higher self-reported focus among private high school students, although most of these individual differences did not reach statistical significance when tested. The clearest result was in Week 2, where students who ate breakfast at approximately 9:30 am reported statistically significantly lower pre-lunch hunger than the control group ($p < .001$); differences in fatigue and focus that week, and all differences observed in Week 1, were in the expected direction but were not statistically significant. This pattern suggests that the timing of breakfast, not just its presence, may matter for student wellbeing, and that private schools may benefit from implementing programs that allow students to purchase or eat breakfast between 9:30 and 10:00 in the morning. However, given the self-reported nature of all outcome measures, the small and non-random samples, the repeated-measures structure of the intervention data, and the lack of control for confounding variables, these conclusions should be treated as preliminary and exploratory rather than definitive.

IMPLICATIONS

Based on the analysis of the results, it may be worthwhile for private high schools to reconsider their breakfast policies. Based on the results of the second week of the experiment, there is a suggested benefit for students to have the option to eat breakfast at school, as it was associated with maintaining focus and energy throughout their morning classes. Most importantly, the scheduled Wednesday concession at the school where the experiment was conducted appears, based on these descriptive results, to have been a positive addition for students; however, it is not offered as frequently as it could be to fully support students throughout the school week. It is important for schools, students, PTO staff, and administrators to consider implementing a more permanent program. PTO staff should work with the administration to explore the feasibility of offering purchasable breakfast on all school days each week. Additionally, expanding this purchasable breakfast program to other private schools is important to ensure that all students have access to the same benefits.

It is also increasingly important that students worldwide become informed about these findings. Not only has this experiment suggested possible benefits of breakfast for students, but many others have reported similar findings. It is crucial that students understand the potential benefits of eating breakfast, as it has been associated with noticeable effects on students' hunger, energy, mood, and focus throughout the day. If students are not informed, they will continue to overlook the importance of breakfast, potentially leaving them feeling less focused, energized, and prepared to engage throughout their school day. This study did not directly measure academic performance, so any implications for grades or test scores should be considered speculative rather than demonstrated.

LIMITATIONS

Several important limitations should be considered when interpreting the findings of this study. First, all primary outcome measures (hunger, energy, mood, and focus) were entirely self-reported via Likert-scale surveys. Self-report data are inherently subjective and susceptible to response bias, social desirability effects, and day-to-day variability in how participants interpret scale anchors. These measures should not be taken as objective indicators of cognitive function or academic performance.

Second, the sample sizes across phases were small and decreased substantially: 118 respondents in the initial survey, 46 participants in Week 1, and only 18 participants in Week 2. These small samples significantly limit statistical power and the generalizability of findings to the broader private high school population. Chi-square and Fisher's exact tests were applied to the Week 1 and Week 2 intervention data to assess whether observed differences between groups exceeded what would be expected by chance; however, because these tests were run on pooled daily reports rather than one independent observation per student, and because most comparisons did not reach statistical significance, results should still be interpreted cautiously rather than as confirmed effects.

Third, the study did not control for key confounding variables that may have influenced self-reported outcomes, including sleep duration, stress levels, academic workload, physical activity, caffeine intake, and underlying health conditions. As a result, any associations observed between breakfast and student wellbeing cannot be attributed to breakfast alone.

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One limitation of this research is that, due to school deadlines, the experiment was rushed and could not be completed to its full potential. Ideally, each phase of the experiment should have lasted longer than one week to obtain the best, most accurate results, but the deadline did not allow it. Another notable limitation is that the sample size for both weeks of the experiment, specifically week two, was very small, suggesting the results were less precise or less representative of the entire high school population. For instance, there were 118 respondents to the initial survey, 46 participants in Week 1, and 18 participants in Week 2. If this experiment were replicated or the researcher had more time, a larger sample size would be collected. In addition to the sample size, the researcher was unable to randomly assign participants to groups in week 2 of the experiment. Since week 2 required students who would otherwise skip breakfast to eat it, the researcher had to account for health-related restrictions on breakfast consumption. As a result, the researcher had to exclude these students from the experimental group, creating a nonrandom assignment.

Moreover, there was an issue with field trips during week 1 of the experiment. There was an all-day field trip to a convention, so students were not at school or on campus, and therefore were not eating at normal school times. This interfered with their true school-related hunger levels due to the messed-up schedule, which may have affected the true results. A similar issue arose in week 2, when two students did not attend school. Given the already small sample size, the absence of two students may have affected the results.

FUTURE DIRECTIONS

It would be beneficial for future researchers who expand on this work to extend the experiment over a longer time span and with a substantially larger and more demographically diverse sample. This would allow for the application of inferential statistical tests and for results to be indicative of the larger high school student population. Additionally, in the replication, the researcher should plan the experiment during a time frame with no field trips scheduled to achieve the most consistent results. Future studies should collect demographic data, including grade level, age, and sex, to allow for subgroup analyses. Collecting objective measures of academic performance, such as test scores, attendance, or teacher-rated behavior, would also strengthen the evidence base. Future research should also examine other factors to better help students. For example, researchers could replicate the methods used in this study, but instead of testing whether eating breakfast makes a difference, they could determine which breakfast foods are most beneficial for supporting students' hunger, energy, mood, and focus. Beyond replication, this research paper and its results should help private high schools recognize that going roughly five hours without eating may leave students feeling hungrier, more fatigued, and less focused, based on the patterns observed in this study. Schools should use this research to implement a PTO-run concession stand that operates every school day, so students have the opportunity to eat breakfast when they are actually hungry, not when they are "supposed to eat."

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