Food for Thought: How Skipping Lunch and Psychiatric Illness Affect Cognition

Tatyana Bidopia, Nandini Datta MA, Gaurie Mittal BS, Adam Kiridly BS,
Erik Savereide BS, Aishwarya Nag BS, Nancy Zucker PhD
Duke Center for Eating Disorders

Introduction

- Meal skipping is common in young adults, and skipping breakfast has been associated with impaired functioning in tasks involving memory, set-shifting, and attention.[1-4]
- Few studies have focused on the effects of skipping lunch, though research indicates that there is a two-hour "post-lunch dip" in cognitive performance following lunch consumption.[5,6]
- Existing literature has yet to explore moderating factors in the relationship between skipping lunch and cognition. Of note, depression and anxiety have been associated with similar cognitive impairments as those seen with meal skipping.[7,8]
- The current study investigated the following question:
  - **Do depression and/or anxiety symptoms moderate the relationship between skipping lunch and cognitive functioning after the "post-lunch dip" period?**

Methods

	Lunch (638 cal; n = 52)	Lunch Omission (48 cal; n = 47)
	Mean ± SD	Mean ± SD
Age	19.60 ± 1.52	19.78 ± 1.61
Sex	Males = 13; Females = 39	Males = 20; Females = 27
BMI	23.04 ± 2.82	23.00 ± 3.74
BDI-II	8.12 ± 7.99	7.17 ± 7.22
STAI-State	32.71 ± 10.67	33.55 ± 9.95
STAI-Trait	37.81 ± 12.06	38.74 ± 12.80
EDE-Q	2.36 ± 1.13	2.08 ± 0.97

Table 1. (above) Demographics; *Table 2*. (below) Study Flow

Time	Task	Measure	Variables
11:10 AM	Energy/Affect/Satiety Questionnaire	Visual Analog Scales	Energy, affect, and satiety
	Shake Consumption & 2-hour Wait Period	-	-
	Demographics	Forced-choice questions	Age, sex, BMI, race, year, major, GPA
1:30 PM	Energy/Affect/Satiety Questionnaire	Visual Analog Scales	Energy, affect, and satiety
1:40 PM	Neuropsychological Battery	Spatial Addition, Verbal Paired Associates 1 & 2, Color Word Interference, Trail Making Test, Continuous Performance Task	Short-term & long term working memory, psychomotor functioning, sustained attention, and set-shifting
3:00 PM	Post-Test Questionnaire	BDI-II, STAI, & EDE-Q	Depression, anxiety, and eating disorder symptoms

Results

	β	Standard Error	*t*	*p*
BDI Score > 13	-0.22	0.51	-0.43	0.67
Study Condition	-0.16	0.33	-0.49	0.63
BDI Score x Study Condition	-3.31	0.94	-3.53	0.001*

Note. $R^2 = 0.19$, $F(3,92) = 7.43$, $p = 0.0002$*, Cohen's $f^2 = 0.24$

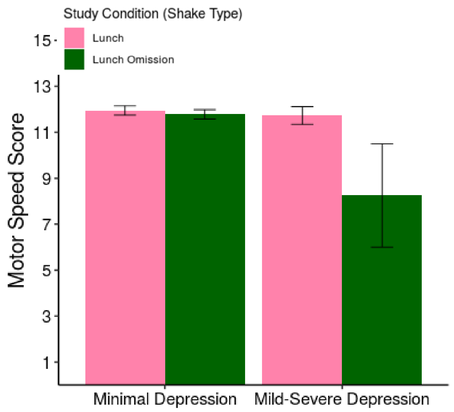

Table 3 & Figure 1. (above) For individuals with BDI-II scores above 13, individuals who skipped lunch performed worse on the motor speed task than individuals who consumed lunch.

	β	Standard Error	*t*	*p*
BDI Score > 13	-1.55	0.74	-2.08	0.04*
Study Condition	-0.42	0.48	-0.87	0.38
BDI Score x Study Condition	2.96	1.36	2.18	0.03*

Note. $R^2 = 0.06$, $F(3,94) = 1.96$, $p = 0.13$, Cohen's $f^2 = 0.06$

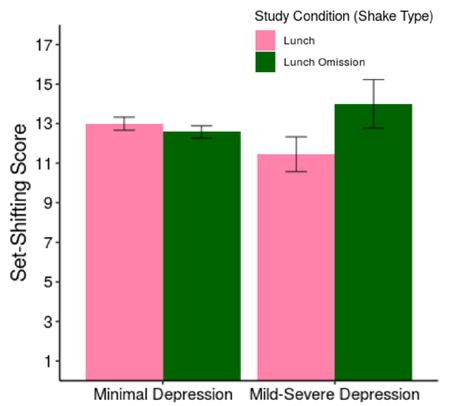

Table 4 & Figure 2. (above) For individuals with BDI-II scores above 13, individuals who skipped lunch performed better on the set-shifting task than individuals who consumed lunch.

	β	Standard Error	*t*	*p*
BDI Score	-0.02	0.03	-0.69	0.54
Study Condition	-1.19	0.53	-2.23	0.03*
BDI Score x Study Condition	0.11	0.05	2.24	0.03*

Note. $R^2 = 0.07$, $F(3,94) = 2.43$, $p = 0.07$, Cohen's $f^2 = 0.08$

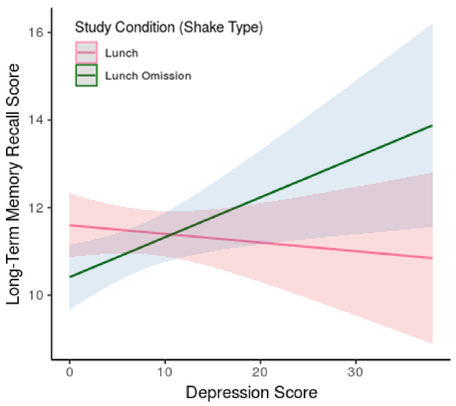

Table 5 & Figure 3. For higher BDI-II scores, individuals who skipped lunch performed better on the long-term memory task than individuals who consumed lunch.

	β	Standard Error	*t*	*p*
Trait Anxiety > 39	-1.12	0.55	-2.03	0.04*
Study Condition	-1.28	0.53	-2.42	0.02*
Trait Anxiety Score x Study Condition	1.96	0.79	2.49	0.01*

Note. $R^2 = 0.07$, $F(3,92) = 2.48$, $p = 0.07$, Cohen's $f^2 = 0.08$

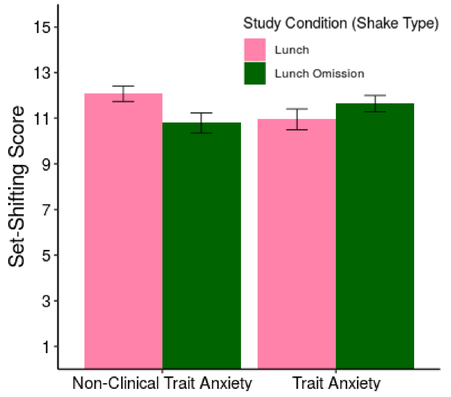

Table 6 & Figure 4. For individuals with higher trait anxiety scores, individuals who skipped lunch performed better on the set-shifting task compared to individuals who consumed lunch.

Discussion

Implications

- We found novel moderation effects of common eating disorder comorbidities of depression and anxiety on the relationship between skipping lunch and cognitive functioning.
- Acute food restriction and the biochemical changes associated with such restriction (e.g., lower blood glucose, dysregulated cortisol secretion) may result in short-term, acute cognitive enhancement, and the comorbidity of eating disorders, depression, and anxiety may reinforce these effects.[9,10]
- Students at Duke University may be accustomed to meeting high cognitive demands despite reporting erratic eating behaviors, corresponding to the lack of significant effects of depression or anxiety symptoms on short-term memory or attention measures.

Limitations

- This study was generally underpowered to detect differences between study conditions for clinical measures such as the BDI-II, with only 15 individuals reporting mild-severe depression symptoms in the sample.
- There was not a clinical comparison group in this study to draw more reliable comparisons between individuals who met and did not meet clinical criteria for depression, trait anxiety, or state anxiety.
- This study was conducted on a high-performing population of college students, limiting the generalizability of study results to the general young adult population.

Future Directions

- It is worth further analyzing the consequences of meal skipping on cognition in a vulnerable population (e.g. college students) and the factors that contribute to this relationship.
- Parsing out the effects of chronic vs. acute food restriction would be beneficial to differentiate the effects of these behaviors on cognition.
- Including a clinical comparison group and a larger sample size would enhance the interpretability of these results.

References

1. Huang, Y.-L., Song, W. O., Schemmel, R. A., & Hoerr, S. M. (1994). What do college students eat? Food selection and meal pattern. *Nutrition Research*, *14*(8), 1143–1153. https://doi.org/10.1016/S0271-5317(05)80242-8
2. Cooper, S. B., Bandelow, S., & Nevill, M. E. (2011). Breakfast consumption and cognitive function in adolescent schoolchildren. *Physiology & Behavior*, *103*(5), 431–439. https://doi.org/10.1016/j.physbeh.2011.03.018
3. Mahoney, C. R., Taylor, H. A., Kanarek, R. B., & Samuel, P. (2005). Effect of breakfast composition on cognitive processes in elementary school children. *Physiology & Behavior*, *85*(5), 635–645. https://doi.org/10.1016/j.physbeh.2005.06.023
4. Wesnes, K. A., Pincock, C., Richardson, D., Helm, G., & Hails, S. (2003). Breakfast reduces declines in attention and memory over the morning in schoolchildren. *Appetite*, *41*(3), 329–331. https://doi.org/10.1016/j.appet.2003.08.009
5. Kanarek, R. B., & Swinney, D. (1990). Effects of food snacks on cognitive performance in male college students. *Appetite*, *14*(1), 15–27. https://doi.org/10.1016/0195-6663(90)90051-9
6. Müller, K., Libuda, L., Terschlüsen, A. M., & Kersting, M. (2013). A Review of the Effects of Lunch: On Adults' Short-term Cognitive Functioning. *Canadian Journal of Dietetic Practice and Research*, *74*(4), 181–188. https://doi.org/10.3148/74.4.2013.181
7. Rock, P. L., Roiser, J. P., Riedel, W. J., & Blackwell, A. D. (2014). Cognitive impairment in depression: a systematic review and meta-analysis. *Psychological Medicine*, *44*(10), 2029–2040. https://doi.org/10.1017/S0033291713002535
8. Murphy, Y. E., Luke, A., Brennan, E., Francazio, S., Christopher, I., & Flessner, C. A. (2018). An Investigation of Executive Functioning in Pediatric Anxiety. *Behavior Modification*, *42*(6), 885–913. https://doi.org/10.1177/0145445517749448
9. Witbracht, M., Keim, N. L., Forester, S., Widaman, A., & Laugero, K. (2015). Female breakfast skippers display a disrupted cortisol rhythm and elevated blood pressure. *Physiology & Behavior*, *140*, 215–221. https://doi.org/10.1016/j.physbeh.2014.12.044
10. Zucker, N., Watson, K., Bulik, C., Merwin, R., & Yoskowitz, J. (2013, April). Individual Variation in Response to a 24-Fast: Effects on Mood, Energy, Cognition, and Body Preoccupation.