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Nutritional Patterns and Executive Functioning among Young Adults: An Exploratory Study

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Abstract

This study aimed to investigate the role of dietary patterns on executive functioning among young adults. A purposive sample consisting of 400 participants with the distribution of 200 males and 200 female undergraduate students aged 19-24 years was selected from public universities in Lahore city, Pakistan. All participants were requested to fill out the demographic form along with the Food Preferences scale (FFQ) to measure food preferences, Adults Executive Functioning Inventory (ADEXI) to measure the executive functioning of young adults. Simple Regression analysis was run to predict Executive Functioning of young adults on their food preferences. Results revealed that healthy food preferences predict less impaired adults' executive functioning, including working memory and inhibition. This study contributes to the growing body of evidence that underscores the pivotal role of dietary choices, particularly the consumption of vegetables and the avoidance of unhealthy snacks, in shaping executive functions of young adults. These findings hold implications not only for individual health but also for public health policies aimed at promoting healthy aging and preventing cognitive disorders.

***Keywords*:** dietary pattern, vegetables, fruits, meat, dairy, snacks, starches, executive functioning, working memory, inhibition

1. Introduction

A balance diet supplies the necessary 24 essential nutrients, including elements like potassium, manganese, and nitrogen. (Austin et, al. 2011). Young adults in Pakistan are not meeting the recommended daily intake of essential nutrients. They are falling short of consuming foods rich in necessary elements such as vegetables, whole grains, and beneficial fatty acids. This deficiency can have significant implications for their overall health and cognitive development. (Habib et al., 2016). The study establishes a link between dietary choices and executive functioning of young adults. Attaining optimal nutrition is crucial for fostering, sustaining, and controlling both physical functioning and cognitive development across all stages of life. Young people consistently fail to meet the recommended scores on the USDA Healthy Eating Index, a measure that evaluates their overall consumption of both nourishing and less healthy foods (Guenther et al., 2013). This issue is prevalent across various age groups, with evidence indicating that the quality of nutrition decreases as children grow older and persists through their teenage years (Banfield et al., 2016). This pattern persists into a developmental phase known as emerging adulthood, typically spanning from 18 to 25 years of age (Nelson et, al. 2008).

This study aims to e encounters of young adult concerning their dietary habits, by assessing the impact of these habits on their executive functioning abilities. Executive function (EF) serves as a cognitive process governing goal-directed behavior, encompassing distinct yet interrelated domains. Executive Functioning exhibit developmental trajectories, with crucial stages during preschool, elementary, early adolescent, and emerging adult years. Executive Functioning is integral to making informed dietary decisions (Boswell & Kober, 2016)

Cohen et al. (2016) conducted a meta-analysis influence of dietary patterns on the executive functioning of children and adolescents aged 6 to 18 years. A meticulous examination was conducted, encompassing studies that explored the correlation between executive functioning and meal quality, macronutrient composition, and specific foods. The evaluation of study quality was a critical aspect of this analysis. Longitudinal investigations (n = 6) indicated consistently positive associations between an improved overall diet and enhanced executive functioning. In contrast, studies scrutinizing the immediate effects of diet (n = 6) exhibited variability in outcomes; nevertheless, they collectively suggested that an elevation in food quality could potentially yield positive effects on executive functioning. Noteworthy trends emerged from the aggregated findings of the ten studies centered on specific foods. An inverse relationship manifested between executive function and the consumption of less nutritious snack foods, sugar-sweetened beverages, and red/processed meats. Conversely, a positive correlation was discerned between executive function and the intake of health-promoting foods like whole grains, fish, fruits, and vegetables.

1.1. Rationale

Given the unique dietary patterns and nutritional challenges faced by young adults in Pakistan, studying the role of their dietary habits on executive functioning had substantial relevance. This research could potentially shed light on strategies to improve both nutrition and cognitive well-being in this population. This study aimed to bridge the gap in understanding how dietary habits of young adults in Pakistan affected their executive functioning abilities. By building

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on existing research and focusing on a specific cultural context, this study could contribute valuable insights into the interplay between nutrition and cognitive development during emerging adulthood.

1.2. Objectives

The primary objective of this study is to investigate the dietary habits of young adults in Pakistan and assess the role of these habits on their executive functioning abilities. The study aims to understand how the dietary choices made by young adults influence their cognitive processes related to executive functioning.

2. Method

2.1. Sample

The sample of study was 400 undergraduate students (200 Male and 200 Female) ranging from 19-24 years from public universities in Lahore.

2.2. Inclusion Criteria

Only undergraduate students were selected from the public universities of Lahore.

2.3. Exclusion Criteria

- Students going gym, and following any type of dieting schedule were not included in this study
- Students suffering from any physical or mental ailment were also not selected.

3. Measures

3.1. Food preference questionnaire for adolescents and adults (FFQ)

A translated and adaptive version of the self-report food preference questionnaire was used to assess the food preferences of young adults. Smith et al. (2016) originally developed this self-report food preferences questionnaire. This self-report measure consists of 62 food items and is divided into six categories: 1. Vegetables (18 items) 2. Fruit (7 items) 3. Meat/fish (12 items) 4. Dairy (10 items) 5. Snacks (9 items) 6. Starches (6 items). A Likert type response format “does not like” to like a lot was used. Food preferences are ranked 1-5 (1 for dislike, 5 for like). A higher score indicates more liking. The test-retest reliabilities of food preferences scale ranges from 0.61 to 0.95, indicating a fairly stable test. Internal reliability (Cronbach's) of full scale and 6 food categories are (62 items $\alpha = 0.95$) 1. Vegetables (18 items $\alpha = 0.94$) 2. Fruit (7items $\alpha = 0.85$) 3. Meat/fish, (12 items $\alpha = 0.89$) 4. Dairy (10 items $\alpha = 0.89$) 5. Snacks (9 items $\alpha = 0.86$) 6. Starches (6 items $\alpha = 0.88$).

3.2. Adult Executive Functioning Inventory (ADEXI)

A translated version of Adults executive functioning inventory (ADEXI) was used to assess the executive functioning of young adults. Holst and Thorell developed a self-report version of the Adult Executive Functioning Inventory (ADEXI) in 2016. This test consists of 14 items, including 9 items related to working memory (1,2,5,7,8,9,11,12,13) and 5items relating to inhibitory control (3,4,6,10,14). The translated version of ADEXI is a highly reliable test with full-scale reliability (.91), working memory (.88), and inhibition control (.78). Responses are taken on 5 points Likert type scale. This self-report measure is rated 1-5, with 1 indicating "definitely not true" and 5 indicating "definitely true." A higher score indicates greater impairment in executive functioning. (Holst &Thorell, 2016).

3.3. Procedure

Following the endorsement of the research subject by the Advanced Studies and Research Board (AS&RB) of Government College University (GCU), Lahore, official permission was sought from the authors of the measurement tools. The selection of participants adhered to the study's inclusion and exclusion criteria, with engagement being sought from young adults enrolled in public universities within Lahore city. Employing a purposive sampling approach, data was systematically acquired. Data collection occurred through personal interactions with participants, with schedules and locations agreed upon for convenience. Participants were provided with comprehensive information about the study's objectives, and their informed consent was obtained. The security and confidentiality of the shared information were guaranteed throughout the process. The distribution of questionnaires took place within their respective institutions, where a total of 500 questionnaires were printed and dispensed. Ultimately, 470 fully completed questionnaires were returned, as a few respondents chose not to participate. This resulted in a final dataset comprising 400 completed questionnaires. The process of completing the questionnaires took each participant approximately 15-20 minutes. Subsequent to data collection, IBM SPSS 26 (Statistical Package for the Social Sciences, version 26) was employed to analyze the gathered data.

3.4. Analysis

To ascertain the relationships among the study variables, the Pearson Product Moment correlation was employed. This allowed for a comprehensive understanding of the associations between dietary patterns, and executive functioning. In order to ascertain whether dietary patterns could predict executive functioning, multiple regression analysis was conducted.

4. Results

Table 1: Correlations for Study Variables

Variables	1	2	3	4	5	6	7	8	9	10
1.Vegetables		.39**	.21**	.43**	.32**	.54**	.20**	.23**	.21**	.20**
2.Fruit		.28**	.28**	.29**	.35**	.17**	-.10*	-.11*	-.07	
3.Meat			.46**	.26**	.34**	.11*	-.09	-.08	-.08	
4.Dairy				.53**	.48**	.06	-.02	-.02	-.01	
5.Snacks					.44**	-.04	.15**	.13**	.14**	
6.Starches							.13**	-.09	-.07	-.09
7.ADEX								.94**	.84**	
8.WM									.82**	
9.Inhibition										

**P<,.05, ** p<.01,*

The correlation analysis indicated that Vegetables have a significant positive relationship with fruits (r =.39**, p<.01) meat (r =.21** p<.01) dairy (r=.43** p<.01) snacks (r =.32** p<.01) and starches (r =.54** p<.01) executive functioning (r = .23** p<.01) working memory (r = .21** p<.01) and inhibition (r =.20**). Fruits has a significant negative relationship with working memory (r = -.11**, p<.01) snacks has positive relationship with ADEXI (r = .15** p<.01) working memory (r = .13** p<.01) and inhibition (r = .14* p<.05).

Table 2: Dietary patterns as Predictors of Executive Functioning

Predictors	*B*	*SE B*	B
Vegetables	-.186	.041	-.272***
Fruits	-.124	.133	-.050
Meat	-.099	.061	-.089
Dairy	.006	.085	.0058
Snack	.452	.092	.286***
Starches	-.053	.128	-.026
R^2			.122
ΔR^2			.108
F			9.06***

*Note. N =400. ***P<.001.*

Table shows the impact of dietary patterns on adults' executive functioning. The R^2 value explains *12%* variance in executive functioning can be accounted for by the vegetables and the snacks. Vegetables and snacks are the predictors of the executive functioning. The more the vegetable intake the lesser the executive functioning would be. Since the score of the scale indicated that the lesser the score the better executive functioning. Less Score on executive functioning means effective executive functioning. Vegetables are also the predictor of the executive functioning which means the more intake of vegetables the better executive functioning of young adults. While more the intake of snacks the more impaired the executive functioning of young adults.

Table 3: Food preferences as predictors of Working Memory and Inhibition

Predictors	Working		Memory		Inhibition	
	B	*SE B*	B	*B*	*SE B*	B
Vegetables	-.117	.028	-.252**	-.069	.018	-.239**
Fruits	-.107	.091	-.063	-.017	.057	-.017
Meat	-.059	.042	-.078	-.040	.026	-.085
Dairy	-.001	.058	.001	.008	.036	.014
Snacks	.277	.063	.258***	.175	.039	.261***
Starches	-.007	.088	-.005	-.045	.055	-.052
R^2			.102			.098
ΔR^2			.089			.084
F			7.47***	`		7.11***

*Note. N =400.***P<.001.*

Table 3 shows the impact of dietary patterns on adults' working memory and inhibition. The R2 value explains 10% variance in working memory and inhibition can be accounted for by the vegetables and the snacks. Vegetables and snacks are the predictors of the working memory and inhibition. The more the vegetable intake the better the working memory and less the inhibition would be. Since the score of the scale indicated that the lesser the score the better working memory and inhibition. The more the vegetable intake the better working memory and lesser the inhibition of young adults. While the more the intake of the snacks the greater would be the impaired working memory and inhibition of young adults.

5. Discussion

This study was conducted to determine the predictive association between categories of food preferences among young adults and their executive functioning. A multiple regression analysis was conducted to explore whether preferences for healthy foods could serve as predictors for executive functioning (specifically working memory and inhibition). The research outcomes revealed that the consumption of vegetables emerges as a predictor for favorable executive functioning. Conversely, the consumption of snacks was found to predict poor executive functioning. These findings align with existing literature. A meta-analysis by Naghshi et al. (2022) encompassing 16 studies demonstrated an inverse relationship between higher fruit and vegetable intake and the prevalence of cognitive disorders among the elderly. Notably, particular dietary choices are intricately linked to optimal cognition and reduced cognitive disorder prevalence. For instance, the inclusion of strawberries, tofu, and edible mushrooms has been associated with a decreased cognitive disorder prevalence (Agarwal et al., 2019).

The study's findings corroborate numerous prior investigations, which have highlighted that the high presence of antioxidant nutrients in fruits and vegetables signifies that greater intake or higher plasma concentrations of these nutrients correlate with enhanced cognitive status in older adults (Ozawa et al., 2013; Loef & Walach, 2012). Additionally, epidemiological studies have reported that heightened antioxidant intake can mitigate the risk of cognitive disorders or dementia (Tangney et al., 2014). Specific categories of fruits and vegetables, such as berries, soybeans, bean products, dark green leafy vegetables, nuts, cruciferous vegetables, root vegetables, fungi, and nuts, have also demonstrated protective effects against cognitive disorders (Agarwal et al., 2019; Jiang et al., 2017; Ozawa et al., 2013; Nooyens et al., 2011). The potential anti-inflammatory attributes of fruits and vegetables could contribute to their advantageous impacts on cognitive function in older adults. Two cohort studies by Shivappa et al. (2014) suggested inflammation-related dietary patterns and diets rich in vegetables, fruits, whole beans, and seafood characterized as anti-inflammatory diets correlated with a more gradual decline in cognitive capabilities. Conversely, individuals adhering to more pro-inflammatory diets exhibited a swifter decline in cognitive and reasoning abilities.

Additionally, Chen et al. (2019) highlighted the positive influence of an anti-inflammatory diet on cognitive well-being among older adults. Gomez-Pinilla (2013) postulated that nutrient abundance has an impact on cognitive and emotional processes. Fundamental mechanisms underpinning the effect of diet on brain health and mental function include the consumption of minerals and vitamins that enhance cognitive status, while saturated fats, for instance, negatively affect neural plasticity and cognitive function. Certain gut hormones that traverse into the brain also exert an influence on cognition. Gaining a deeper understanding of the molecular foundations of food's impact on cognition holds the promise of refining dietary strategies to enhance neuronal resilience and foster mental fitness.

In conclusion, the comprehensive exploration through multiple regression analysis has shed light on the intricate relationship between dietary choices, cognitive function of young adults. The study's findings underscore the significance of healthy food preferences, particularly the consumption of vegetables, in predicting positive executive functioning. Equally important is the cautionary note that the consumption of snacks may lead to compromised executive functioning.

6. Conclusion

this study contributes to the growing body of evidence that underscores the pivotal role of dietary choices, particularly the consumption of vegetables and the avoidance of unhealthy snacks, in shaping cognitive functions of young adults. These findings hold implications not only for individual health but also for public health policies aimed at promoting healthy aging and preventing cognitive disorders.

6.1. Limitation

The sample composition, which may not be fully representative of the broader elderly population, could limit the generalizability of the findings. Longitudinal studies that track individuals' diets and executive functioning would provide a more robust understanding of the dynamic relationship between diet and executive functioning of adults.

References

Agarwal, P., Wang, Y., Buchman, A. S., Bennett, D. A., & Morris, M. C. (2019). Dietary patterns and self-reported incident disability in older adults. *The Journals of Gerontology: Series* A, 74(8), 1331-1337.

Austin, G. L., Ogden, L. G., & Hill, J. O. (2011). Trends in carbohydrate, fat, and protein intakes and association with energy intake in normal-weight, overweight, and obese individuals: 1971–2006. *The American journal of clinical nutrition*, 93(4), 836-843.

Banfield, E. C., Liu, Y., Davis, J. S., Chang, S., & Frazier-Wood, A. C. (2016). Poor adherence to US dietary guidelines for children and adolescents in the national health and nutrition examination survey population. *Journal of the Academy of Nutrition and Dietetics*, 116(1), 21-27.

Boswell, R. G., & Kober, H. (2016). Food cue reactivity and craving predict eating and weight gain: a meta-analytic review. *Obesity reviews*, 17(2), 159-177.

Chen, X., Maguire, B., Brodaty, H., & O'Leary, F. (2019). Dietary patterns and cognitive health in older adults: a systematic review. *Journal of Alzheimer's Disease*, 67(2), 583-619.

Cohen, J. F., Gorski, M. T., Gruber, S. A., Kurdziel, L. B. F., & Rimm, E. B. (2016). The effect of healthy dietary consumption on executive cognitive functioning in children and adolescents: a systematic review. *British Journal of Nutrition*, 116(6), 989-1000.

Guenther, P. M., Casavale, K. O., Reedy, J., Kirkpatrick, S. I., Hiza, H. A., Kuczynski, K. J., ... & Krebs-Smith, S. M. (2013). Update of the healthy eating index: HEI-2010. *Journal of the Academy of Nutrition and Dietetics*, 113(4), 569-580.

Gomez-Pinilla, F., & Hillman, C. (2013). The influence of exercise on cognitive abilities. *Comprehensive Physiology*, 3(1), 403.

Jiang, X., Huang, J., Song, D., Deng, R., Wei, J., & Zhang, Z. (2017). Increased consumption of fruit and vegetables is related to a reduced risk of cognitive impairment and dementia: Meta-analysis. *Frontiers in aging neuroscience*, 9, 18.

Holst, Y., & Thorell, L. B. (2018). Adult executive functioning inventory (ADEXI): Validity, reliability, and relations to ADHD. *International journal of methods in psychiatric research*, 27(1), e1567.

Habib, M. A., Black, K., Soofi, S. B., Hussain, I., Bhatti, Z., Bhutta, Z. A., & Raynes-Greenow, C. (2016). Prevalence and predictors of iron deficiency anemia in children under five years of age in Pakistan, a secondary analysis of national nutrition survey data 2011–2012. *PloS one*, 11(5).

Loef, M., & Walach, H. (2012). Fruit, vegetables and prevention of cognitive decline or dementia: a systematic review of cohort studies. *The journal of nutrition, health & aging*, 16, 626-630.

Nelson, M. C., Story, M., Larson, N. I., Neumark-Sztainer, D., & Lytle, L. A. (2008). Emerging adulthood and college-aged youth: an overlooked age for weight-related behavior change. *Obesity*, 16(10), 2205.

Naghshi, S., Sadeghi, O., Larijani, B., & Esmaillzadeh, A. (2022). High vs. low-fat dairy and milk differently affects the risk of all-cause, CVD, and cancer death: A systematic review and dose-response meta-analysis of prospective cohort studies. *Critical reviews in food science and nutrition*, 62(13).

Shivappa, N., Steck, S. E., Hurley, T. G., Hussey, J. R., & Hébert, J. R. (2014). Designing and developing a literature-derived, population-based dietary inflammatory index. *Public health nutrition*, 17(8), 1689-1696.

Smith, W., Mitchell, P., Reay, E. M., Webb, K., & Harvey, P. W. (1998). Validity and reproducibility of a self-administered food frequency questionnaire in older people. *Australian and New Zealand journal of public health*, 22(4), 456-463

Ozawa, M., Ninomiya, T., Ohara, T., Doi, Y., Uchida, K., Shirota, T., ... & Kiyohara, Y. (2013). Dietary patterns and risk of dementia in an elderly Japanese population: the Hisayama Study. *The American of Clinical Nutrition*, 97(5), 1076-1082.

Tangney, C. C., Li, H., Wang, Y., Barnes, L., Schneider, J. A., Bennett, D. A., & Morris, M. C. (2014). Relation of DASH-and Mediterranean-like dietary patterns to cognitive decline in older persons. *Neurology*, 83(16), 1410-1416.