



Original Article

Effects of Breakfast on Physical Activity, Attentiveness and Cognitive Functions in Young Adults of Islamabad, Pakistan; A Comparative Cross-sectional Study

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ABSTRACT

Background: The prevalence of breakfast skippers among the young population appears to be increasing. Several studies have been conducted on the breakfast routines of children and their effects, but young adults have been neglected. **Objective:** To compare the impact of breakfast eaters and skippers on physical activity, attentiveness and cognition in young adults of Islamabad, Pakistan. **Methods:** A comparative cross-sectional study, carried out at Shifa Tameer e Millat University Islamabad, Pakistan from August 2020 to January 2021. Healthy young adults of both genders aged 18-25 years were included except those having any active pathology, mental illness, sedative-hypnotics or smokers were excluded from the study. Informed consent was taken from each participant's priority. About 100 participants were enrolled in the study (50 in each group) through non-probability purposive sampling. Respondents were allocated to groups A (breakfast eaters) and B (breakfast skippers) based on the criteria taken from recent studies. Physical activity and attentiveness were measured through the standard international physical activity questionnaire short form and everyday life attention scale questionnaire respectively whereas cognitive functions were assessed using Stroop and digit span test. **Results:** The mean age of respondents in groups A (breakfast eaters) and B (breakfast skippers) was 21.6 ± 1.77 and 21.3 ± 1.80 years respectively. Physical activity and cognitive functions statistically showed no significant difference between the two groups ($p > 0.05$). For attentiveness, all components of the everyday life attention scale questionnaire showed no significant difference ($p \geq 0.05$) except for the G component (preparing a meal) which showed a significant difference between both groups ($p \leq 0.05$). **Conclusion:** This study concludes that there is no significant difference in breakfast on physical activity, attentiveness and cognitive functions in young adults of Islamabad, Pakistan.

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INTRODUCTION

Of all day-by-day eating events, breakfast is best in class from a dietary point of view, yet the recurrence of breakfast utilization has declined in late many years.¹ This pattern can apply negative consequences such as cardiovascular disease, a high lipid profile, diabetes and many more.² US survey studied the role of breakfast in the general assurance of diet quality and proposed a definition to work around the intake of food as the primary feast of the day. The particular definition proposed was that breakfast is the first meal of the day that breaks the fast after overnight sleep and is consumed within 2 to 3 hours after waking up.³

According to a study of 2014 conducted in selected areas of India, the prevalence of breakfast skipping in school children aged between 10-16 years was 23.50 %⁴ An individual without breakfast would not have enough energy to begin a morning task since it is the primary supper taken after dinner with a long interval of fast. A solid breakfast ought to incorporate three significant nutrition types, for example, grains, milk, and natural products.⁵ According to the United States Department of Agriculture (USDA) Food and Nutrition Service, it ought to convey a sufficient measure of protein, fiber, minerals, nutrients and different micronutrients with ostensible sugar and fat, especially from prepared nutritional categories (National Institute of Nutrition, 2011).

Food utilization and cravings are managed by the nerve center, where the nucleus arcuatus (ARC) regulate energy balance processes by the interaction of peripheral hormonal and metabolic signals.⁵ In the wake of staying asleep for the entire evening, the human body needs to invigorate and recapture energy and supplements to participate in physiological exercises.⁶ According to data from the American Dietetic Association, students who take

breakfast have better capabilities to solve problems, verbal fluency, creativity and recall memory. Recent literature has shown that breakfast eaters have healthy BMI and higher physical activity levels and this also contributed to higher cardiorespiratory fitness.⁷ Skipping or late consumption of breakfast will initiate stress response by the gradual decline of glucose levels which interferes with different aspects of cognitive abilities, such as attention and working memory. Habitual consumption of breakfast in fusion with other aspects positively affects the attention concentration, memory and academic performance of young adults.⁵

Cognitive interference is the process of inhibiting and controlling impulsive responses to generate more situation-specific responses. Cognitive ability helps in planning, anticipating and goal setting. Interference inhibition is a neurological process performed by the dorsolateral prefrontal cortex. Skipping breakfast can cause depletion of nutrients in the central nervous system which is essential for the cognitive functions of the body however, in general, there is still a need to explore the relationship between the nutritive quality of breakfast and cognitive performance.⁸ The prevalence of breakfast skippers among the young population appears to be increasing. Several studies have been conducted on the breakfast routines of children and their effects, but young adults have been neglected.

Previous studies have focused less on the time of breakfast consumption. Furthermore, very limited literature is available regarding the impact of skipping breakfast on attentiveness. This study will help us to understand whether adult behavior towards breakfast has any effect on attentiveness, physical activity and cognitive functions.

METHODS

This was a comparative cross-sectional study that was completed in 6 months time frame starting from August 2020 to January 2021 and approved by the Institutional Review Board of Shifa International Hospital, Islamabad Pakistan. The sample was recruited using non-probability purposive sampling from Shifa College of Medicine, Department of Rehabilitation Sciences and Medical Technology of Shifa Tameer e Milat University Islamabad, Pakistan. The sample size calculated was 70 (35 in each group) by G power with an effect size of 0.8.

Participants included in the study were aged between 18-25 years of both genders and those excluded were smokers, having any active pathology, or mental illness or were on sedative-hypnotics respondents were allocated to groups A (breakfast eaters) and B (breakfast skippers) based on the criteria taken from the recent studies, which was participants who skip their meal 0-1 times a week and before 11 were included in Group A (breakfast eaters). Those who did not fall in any of the above-mentioned criteria were included in Group B (breakfast skippers). Participants who had never or one time a week skipped their meal but after 11 were included in Group B (skippers).

Any respondents who had consumed their breakfast before 11 but skipped it more than one time were also included in Group B (breakfast skipper). The total number of participants included in the study was 100 (50 in each group). A self-structured questionnaire was created under the direction of the supervisor that included demographic data of participants, previous medical history, breakfast routine, time bar within which they were having breakfast and reasons for skipping breakfast. The International Physical Activity Questionnaire-short form (IPAQ-SF) is a well-accepted and reliable tool and has been suggested as the standard method of measuring physical activity with Cronbach's

alpha coefficient value from 0.34 to 0.89.⁹ The Everyday Life Attention Scale (ELAS) questionnaire is a self-reported sensitive and reliable tool for assessing attention capacities of the individual in nine different situations of daily life.¹⁰ Digit span test was used to assess the short-term memory and working memory by Forward Digital Span (FDS) and Backward Digital Span (BDS) test respectively.^{11, 12} Stroop Color and Word Test (SCWT) is a test used extensively to assess multiple cognitive functions and the ability to inhibit cognitive interference that occurs during the processing of any specific stimulus.

This test is a reliable instrument for measuring cognitive function in adults with reliability coefficients in incongruous conditions estimated as 0.91.¹³ The study was recruited with guidance and discussion over all the procedure and how it will go. Informed consent was taken from participants before their enrollment. Confidentiality of the data acquired was affirmed on the consent form. Firstly, questionnaires IPAQ-SF and ELAS were given to participants which were filled by them.¹⁴ Then one of the group members was assigned to perform FDS and BDS on the participant and one with Stroop test (this was performed with a time of 45 seconds using a stopwatch).

Group members exchanged their assigned tasks after every 2 participants. All the tests were carried out in a quiet environment. The total time for spend on the whole activity was 20-25 minutes. Data were analyzed using SPSS version 24. Frequency was calculated for gender, BMI, reasons for breakfast skipping and IPAQ and mean with standard deviation for IPAQ, ELAS, FDS, BDS and Stroop test. An Independent t-test was applied to all the variables to find the difference between the groups. The significance level was set at $p < 0.05$ with a 95% confidence interval.¹⁵

RESULTS

Table I: Mean Scoring of IPAQ-SF and Stroop Test of Both Groups

Tests	Groups	Mean ±Standard deviation	Mean difference	p-value
IPAQ-SF	Breakfast	1701.95± 2312.89	377.50	0.45
	Non-breakfast	2079.45±2744.46		
Stroop Test	Breakfast	1.46±7.06	1.08	0.93
	Non-breakfast	1.57±6.61		

*IPAQ-SF: International Physical Activity Questionnaire-Short Form

Table II: Mean Score of Digit Span Test for Both Groups

Tests	Groups	Mean ±Standard deviation	Mean difference	p-value
FDS	Breakfast	31.76±4.90	1.18	0.28
	Non-breakfast	32.94±5.89		
BDS	Breakfast	20.78±6.73	1.76	0.15
	Non-breakfast	22.54±5.29		

*FDS: Forward Digit Span Test, BDS: Backward Digit Span Test

Table III: Mean Score of ELAS in Both Groups

ELAS	Groups	Mean ±Standard deviation	Mean difference	p-value
ELAS A	Breakfast	52.59±19.93	4.41	0.28
	Non-breakfast	48.17±20.71		
ELAS B	Breakfast	58.44±20.50	2.36	0.57
	Non-breakfast	56.08±20.91		
ELAS C	Breakfast	56.29±22.37	3.65	0.37
	Non-breakfast	52.63±18.59		
ELAS D	Breakfast	51.54±18.59	5.46	0.14
	Non-breakfast	46.08±18.70		
ELAS E	Breakfast	50.74±20.78	3.03	0.45
	Non-breakfast	47.70±20.02		
ELAS F	Breakfast	59.52±19.4	6.83	0.08
	Non-breakfast	52.69±20.3		
ELAS G	Breakfast	72.51±24.41	13.14	*0.01
	Non-breakfast	59.37±26.57		
ELAS H	Breakfast	65.39±22.21	8.36	0.058
	Non-breakfast	57.02±21.44		
ELAS I	Breakfast	59.77±33.87	4.24	0.51
	Non-breakfast	55.53±30.18		

A total of 150 questionnaires were distributed, out of which 120 responses were received. The response rate of the study was 86.6%. From 120 responses, 70 were separated into breakfast eaters (group A) and 50 were skippers (group B). From group A, 50 responses were randomly selected by lottery method to equalize the number of respondents in both groups. From a sample of 100 participants, both groups had equal participants according to inclusion and exclusion criteria for breakfast eaters and skippers. In Group A, the mean and standard deviation of the age was 21.6 ± 1.77 and in Group B, the mean with standard deviation was 21.34 ± 1.8 .

In each groups A and B, 17 (34%) were male and 33 (66%) were female (Fig.2). BMI of all the participants was also assessed in groups A and group B, the highest number of participants falling in normal category i.e. 28(56%) and 27(54%) respectively, whereas in group A lowest number of participants were obese and underweight i.e. 7(14%) same for both categories. In group B lowest category was overweight i.e. 5(10%). Both groups were further assessed for the impact of breakfast on physical activity. According to categorical data of IPAQ, 7(14%) participants of group A and 14(28%) participants of group B reported being involved in a high level of physical activity.

However, in the moderate category, 29(58%) participants were in Group A and 14(28%) were in Group B. 14(28%) of the participant's physical activity level in both groups A and B was low. Physical activity of groups A and B (mean and standard deviation 1701.95 ± 2312.89 and 2079.45 ± 2744.6 respectively) showed no significant difference between both groups with P value ≥ 0.05 (Table.1). Stroop test for cognition was used and a mean score with standard deviation in group A was 1.462 ± 7.06 and in the group, B was 1.57 ± 6.61 (Table I). It showed no significant difference (p-value ≥ 0.05) between the groups. Comparison between the groups on FDS and

BDS showed mean \pm standard deviation of group A 31.76 ± 4.9 and 20.78 ± 6.73 and in group B, it was 32.94 ± 5.89 and 22.54 ± 5.29 respectively. There was no significant difference in p-value ≥ 0.05 between the two groups (Table II). In ELAS scoring, all components showed no significant difference between breakfast eaters and breakfast skippers except for component G (preparing a meal) which showed a significant difference in p-value < 0.05 . ELAS mean score and standard deviation for each situation are given in Table III.

DISCUSSION

The current study ought to determine the role of breakfast on physical activity, attentiveness and cognitive function in young adults aged 18-25 years. This study showed no difference in physical activity of young adults, those having breakfast and those who didn't have it. Previous studies showed blended and mixed patterns of results. Our study results are similar to a cross-sectional study conducted on school-aged adolescents in Delhi, India in 2012 by Monika Arora on 49 participants who showed breakfast consumption, whether daily or sometimes, which was not significantly associated with higher levels of physical activity as compared to never breakfast consumption.¹⁶

The similarity in study results might be due to the reason that both studies did not focus on the habitual patterns of the participants. Another study conducted in 12 different geographic regions showed an association between breakfast and a high level of physical activity. Contradiction with results of the present study might be due to the use of different tools to assess physical activity i.e. accelerometer. According to our study, results showed no significant difference between breakfast eaters and skippers on cognitive functions. A crossover design study conducted on adolescents shows that breakfast has an overall effect on cognitive performance but the results did not show any

significant effect of breakfast on more hard versions of the tasks. The difference in the results of both studies may be due to the different study designs and different age groups. But the study also supports the present study in a way that for the more complex tasks, breakfast may have no role. A Contradictory quasi-experimental study design results showed an improvement in cognitive function using the Stroop Test. The difference might be due to the above-mentioned study being conducted on afternoon meals whereas our study particularly focused on breakfast.⁸

A recent study conducted in 2020 found the prevalence of omitting breakfast and its association with cognitive function in medical students. In this study, 184 undergraduates were enrolled and about 75% of them didn't have breakfast.¹⁷ The results of the study were contradictory to this study, the scores of FDS (short-term memory) and BDS (working memory) were higher in the participants having breakfast. The difference in the studies might be due to the different study designs as the above-mentioned study finds the association of cognition with breakfast whereas the current study is a comparative cross-sectional study.¹⁸

To the best of our knowledge, no study has studied the effect of breakfast on attentiveness using ELAS on the general population. However, there were very few studies that highlighted the effects of breakfast provision in different environment settings on attentiveness. A study conducted on medical students in Dominica opposes the present study results. Alice Solomon and his partners studied the feeding habits of 182 students and their effect on attentiveness. Their study concluded that food intake and its nutritive value have a role in the learning process of children.¹⁹ The above study focused on the overall eating patterns of children while the present study focused particularly on breakfast, this might be the

reason for the opposition in the result. Also, the present study does not include the nutritive value breakfast of for the participants. A crossover clinical trial favoring our study results, done in three years span by Isabella Lovino and her coworkers suggested that breakfast consumption does not affect neurophysiological functioning including attentiveness. Both of the studies did not focus on the habitual breakfast eating and skipping patterns of breakfast of the participants.²⁰ The pandemic situation, COVID-19 had confined us to limit data collection. The generalizability of our results was restricted due to the study area. This study faced gender inequality that is the ratio of males and females was not equal.

CONCLUSION

This study concludes that there is no significant difference in breakfast on physical activity, attentiveness and cognitive functions in young adults of Islamabad, Pakistan.

DECLARATIONS

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

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Authors' contributions: All authors read and approved the final manuscript.

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REFERENCES

1. Nicklas TA, O'Neil C, Myers L. The importance of breakfast consumption to nutrition of children, adolescents, and young adults. *Nutrition today*. 2004; 39(1): 30-9.
2. Uzhova I, Mullally D, Peñalvo JL, Gibney ER. Regularity of breakfast consumption and diet: insights from national adult nutrition survey. *Nutrients*. 2018; 10(11): 1578.
3. Affinita A, Catalani L, Cecchetto G, De Lorenzo G, Dilillo D, Donegani G, et al. Breakfast: a multidisciplinary approach. *Italian journal of pediatrics*. 2013; 39(1): 1-10.
4. Garg M, Rajesh V, Kumar P. Effect of breakfast skipping on nutritional status and school performance of 10-16 years old children of Udupi district. *Health and Population: Perspectives and Issues*. 2014; 37(3-4): 98-117.
5. Gajre NS, Fernandez S, Balakrishna N, Vazir S. Breakfast eating habit and its influence on attention-concentration, immediate memory and school achievement. *Indian Pediatrics*. 2008; 45(10): 824.
6. Boschloo A, Ouwehand C, Dekker S, Lee N, De Groot R, Krabbendam L, et al. The relation between breakfast skipping and school performance in adolescents. *Mind, brain, and education*. 2012; 6(2): 81-8.
7. Sandercock G, Voss C, Dye L. Associations between habitual school-day breakfast consumption, body mass index, physical activity and cardiorespiratory fitness in English schoolchildren. *European journal of clinical nutrition*. 2010; 64(10): 1086-92.
8. Chico Barba LG. Breakfast nutritional quality and cognitive interference in university students from Mexico City. *OPENAIRE*. 2019.
9. Martínez-González MA, López-Fontana C, Varo JJ, Sánchez-Villegas A, Martínez JA. Validation of the Spanish version of the physical activity questionnaire used in the Nurses' Health Study and the Health Professionals' Follow-up Study. *Public health nutrition*. 2005; 8(7): 920-7.
10. Groen Y, Fuermaier AB, Tucha L, Weisbrod M, Aschenbrenner S, Tucha O. A situation-specific approach to measure attention in adults with ADHD: The everyday life attention scale (ELAS). *Applied Neuropsychology: Adult*. 2018.
11. Rabiee A, Vasaghi-Gharamaleki B, Samadi SA, Amiri-Shavaki Y, Alaghband-Rad J. Working memory deficits and its relationship to Autism Spectrum Disorders. *Iranian journal of medical sciences*. 2020; 45(2): 100.
12. Hantoro WD, Setyaningrum CTS, Dahlan P. Reliabilitas dan validitas backward digit span test dalam screening gangguan atensi anak sekolah dasar. *Berkala NeuroSains*. 18(2): 90-3.
13. Wang R-Y, Zhou J-H, Huang Y-C, Yang Y-R. Reliability of the Chinese version of the trail making test and Stroop color and word test among older adults. *International Journal of Gerontology*. 2018; 12(4): 336-9.
14. Uzun N, Tarakci E, Arman N, Ugurlu S. FRI0726B-HPR Investigation of physical activity levels of patients with behcet's disease. *BMJ Publishing Group Ltd*; 2019.
15. Zhao Q-J, Zhang J, Xu L, Liu F-F. Identification of a five-long non-coding RNA signature to improve the prognosis prediction for patients with hepatocellular carcinoma. *World journal of gastroenterology*. 2018; 24(30): 3426.
16. Arora M, Nazar GP, Gupta VK, Perry CL, Reddy KS, Stigler MH. Association of breakfast intake with obesity, dietary and physical activity behavior among urban school-aged adolescents in Delhi, India: results of a cross-sectional study. *BMC Public Health*. 2012; 12(1): 1-12.
17. Keski-Rahkonen A, Kaprio J, Rissanen A, Virkkunen M, Rose RJ. Breakfast skipping and health-compromising behaviors in adolescents and adults. *European journal of clinical nutrition*. 2003; 57(7): 842-53.

18. Moy FM, Surin J, Ismail Y, Mahad R, Tie F, Wan Ismail W. Breakfast skipping and its associated factors among undergraduates in a public university in Kuala Lumpur. *Malaysian journal of nutrition*. 2009; 15(2): 165-74.
19. Madej P. The impact of female adolescents' attitudes toward advertising, locus of control, self-efficacy on body image and eating habits: Wayne State University; 1998.
20. Ewing-Cobbs L, Fletcher JM, Levin HS, Iovino I, Miner ME. Academic achievement and academic placement following traumatic brain injury in children and adolescents: A two-year longitudinal study. *Journal of Clinical and Experimental Neuropsychology*. 1998; 20(6): 769-81.
21. López L, Rodo X. A modified SEIR model to predict the COVID-19 outbreak in Spain and Italy: simulating control scenarios and multi-scale epidemics. *Results in Physics*. 2021; 21: 103746.