

Eating Behaviour and Working Memory: A Correlational Study

Eva Das¹ and Dr. Garima Shukla²

¹Research Scholar, Delhi University

²Asst. Professor, SPM College

E-mail: ¹evadas91@gmail.com, ²shuklagarima1019@gmail.com

Abstract—The purpose of the study is to explore the relationship between Eating Behaviour and Working Memory. This is an empirical research survey. For this, a convenience sample method was adopted. A total of 37 female college students aged 18 to 21 years old were taken for the study from the city of Delhi. Adult Eating Behaviour Questionnaire (AEBQ), a self-report tool, and the Digit Span subtest of Wechsler Adult Intelligence scale (version IV) were conducted. A quantitative analysis was carried out using Bivariate correlation. A positive correlation was found between Enjoyment of Food and Memory, Emotional Over-eating and Memory, and a negative correlation was reported between Emotional Under-eating and Memory. However, the level of significance was not high and satisfactory. These results point towards a direction of the relationship between the variables, studied under this research. However, further research is essential to determine the strength of the relationship.

Keywords: Eating behaviour, Working Memory, AEBQ, Digit Span.

INTRODUCTION

The new age world demands a certain lifestyle. This lifestyle consists of several choices which correspond to the trends and demands of the 21st century. However the new age also means new challenges. In a study where a series of experiments were conducted on rats, it was found that junk food can have detrimental effects on our brain including our memory and can even cause brain damage [2]. Nutrition is vital throughout all the stages of life [4]. The article stresses on the centrality of food in the nutrition-health paradigm. Abraham Maslow, in 1943 talked about the theory of motivation where food has been talked about as a basic physiological need [5]. However, without fulfilling the basic physiological needs, other things like safety needs or self-actualization needs become redundant. David Benton, 2008 classifies the potential influence of diet on brain into two categories [1]. Firstly, it can alter the structural integrity of brain itself. Secondly the utility of energy can have short-term effects on the functioning of a child. John S Allen, 2012 conceives “Theory of Food” as an internal cognitive representation of diet in our minds [18]. The paper discusses the value added nature of food due to the complex interplay of language and culture in our surroundings. As such our eating habits acquire a cognitive

framework based on the various associations we generate throughout our lifetime. Research has found a correlation between the quality of nutrition and behavior in infants less than six months old (Sigman, 1995)[6]. Further, the paper discusses how it is quality and not quantity that is vital for development of cognitive abilities in children.

Eating Behaviour

The concept of Eating Behavior can be quite vague. It can encompass a lot of variables and concepts within itself. However for this study, Eating Behaviour has been seen as a function of three variables of the AEBQ - Enjoyment of Food (EF), Emotional Over-eating (EOE) and Emotional Under-eating (EUE)[17]. Enjoyment of food has been conceptualized as to whether the person loves food, enjoys eating and looks forward to mealtimes. Emotional over-eating refers to the increased tendency to eat when the person is annoyed, worried, upset, anxious or angry. Emotional Over-eating refers to the decreased eating tendency when the person is worried, angry, upset, annoyed or anxious. “Liu and Raine’s study found that undernourished children display various issues like behavioral problems, and aggression with other children” (Benton, 2008)[1]. Over-eating can lead to obesity and excessive body weight has been seen to be linked with deficits in some types of cognitive capabilities throughout lifespan including children and adolescents (Martin 2014) [12].

Working Memory

Earlier researches show a trend where Working Memory and Short-Term Memory were used interchangeably. However, with time, the differences became clear. While Short-Term Memory refers to the temporary storage of information, Working Memory refers to both storage capacity and the capacity to process the information available (Baron, 5th Edition)[15]. The book talks about working memory as an active and dynamic process. The multiple components model of Working memory by Baddely in 1992, categorizes working memory into 3 distinct parts: phonological loop (auditory processing of words), visuospatial sketchpad (visual and

spatial processing of information) and the central executive, which works as a supervisor and coordinator between the other two.

The focus of this study is to try and understand the relation between eating behaviour and memory in adults. With innovations in technology came innovations in food industry. Along with the changes in lifestyle over the years, our eating habits have also transformed with it. This global trend calls for a need to understand as to whether if any and to what extent our dietary choices can impact our cognition. A study done on rats found out that consumption of a western style diet affected the level of dopamine and could have a negative effect on food based learning and memory processes (Nyugen et al, 2017)[10]. The research found that Wwestern diet consumption in rats produced weight gain, neuronal and neurotransmitter changes in their brain.

Method

This is an empirical based research survey in Delhi City, where correlation between the following variables will be explored –

Following variables will be studied under the present study (a) Enjoyment of food (EF), (b) Emotional over-eating (EOE), (c) Emotional under-eating (EUE) and (d) Working Memory.

Sample

A sample of 37 female college students were taken for the study using convenience sampling method. The students were 18 to 21 years old.

Research Tools

AEBQ: To measure the eating behaviours, the Adult Eating Behaviour Questionnaire was used. AEBQ is a reliable and a comprehensive self-report measure of appetitive traits in adults (Hunot et al, 2016)[17]. It is a 35 item questionnaire and has a total of 8 scales Hunger, Food Responsiveness, Emotional over-eating, Emotional Under-eating, Enjoyment of Food, Satiety Responsiveness, Food fussiness, Slowness in eating. Digit Span was used to measure Working Memory. However the scope of this study was limited to Enjoyment of Food, Emotional Over-eating and Emotional Under-eating.

Digit Span: Digit span is one of the most comprehensive tests of Working Memory. It is a substantial subtest of WAIS IV. It has 3 components – Digit Forward, Digit Backwards and Digit Sequencing. In Digit Span Forward, a series of numbers are read which are to be recalled in the manner in which read. In Digit Span Backwards, the number series are to be reported backwards. In Digit Sequencing, the number series read to the subject is reported in an ascending order. Digit Span Forward deals with rote learning and memory, attention, encoding, auditory processing, while Digit Span Backwards interacts with working memory, transformation of information, mental

manipulation and visuospatial imaging (Growth –Marnat mental manipulation (Mac Donald et al, 2002)[3].

Objectives

- (a) To study the relationship between EF and DS,
(b) To study the relationship between EOE and DS (c) To study the relationship between EUE and DS

Procedure

Data collection was conducted in a college setting. At first the students were asked to fill the AEBQ self report questionnaire. After they were done with the AEBQ, the Digit Span subtest of Wechsler Adult Intelligence scale was conducted. The scores for both AEBQ and Digit Span were calculated. This data was then consolidated and run through SPSS software. A Bivariate correlation analysis was carried out to examine the results.

Results

Table 1 shows that the mean for EF was 12.11, with a SD (Standard deviation) of 2.664. The mean for EOE was 10.11 with a SD (Standard deviation) of 4.789. The mean for EUE was 15.19 with a SD (Standard deviation) of 5.517. The mean for DS was 26.59 while the SD (Standard deviation) of 4.498. Table 2 shows that the Pearson's correlation between EF and Digit Span was 0.047. Level of significance (2- tailed) was 0.782. Table 3 shows that the Pearson's correlation between EOE and Digit Span was 0.072 and the level of significance (2- tailed) was 0.672. Table 4 shows that the Pearson's correlation between EUE and Digit Span was -0.126 and the level of significance (2- tailed) was 0.457.

	Minimum	Maximum	Mean	Std. Deviation
EF	4	15	12.11	2.664
EOE	3	23	10.11	4.789
EUE	5	26	15.19	5.517
DIGIT SPAN	17	36	26.59	4.798
Total Data	37			

		DIGIT SPAN	EF
DIGIT SPAN	Pearson Correlation	1	0.047
	Sig. (2-tailed)		0.782
	N	37	37
EF	Pearson Correlation	0.047	1
	Sig. (2-tailed)	0.782	
	N	37	37

Table 3: Correlation between EOE & DS

		DIGIT SPAN	EOE
DIGIT SPAN	Pearson Correlation	1	0.072
	Sig. (2-tailed)		0.672
	N	37	37
EOE	Pearson Correlation	0.072	1
	Sig. (2-tailed)	0.672	
	N	37	37

Table 4: Correlation between EUE & DS

		DIGIT SPAN	EUE
DIGIT SPAN	Pearson Correlation	1	-0.126
	Sig. (2-tailed)		0.457
	N	37	37
EUE	Pearson Correlation	-0.126	1
	Sig. (2-tailed)	0.457	
	N	37	37

Discussion

The aim of the study is to examine the relationship between Eating Behaviour and Working Memory. The objectives of the research were threefold –(a)To study the relationship between EF and DS(b) To study the relationship between EOE and DS (c) To study the relationship between EUE and DS.

Enjoyment of food and Working Memory

A positive Pearson's correlation of 0.047 was seen between EF and Memory (DS) but a low level of significance (0.782) was reported. Some previous research seems to support the results found in our study. Lee and Sternthal, in 1999, while investigating the effect of mood on the learning of brand names found that being in a positive mood enhanced the learning of brand names in relation to a neutral mood among their subjects[19]. But as the significance level was found to be low, it needs further investigation to establish the strength of the relationship.

Emotional over-eating and Working Memory

Again a very low positive Pearson's correlation of 0.072 between EOE and DS was found, at a very low significance level of 0.672 which does not reflect any strong relationship between the two. Previous researches point towards a clear negative linear relationship between over-eating and memory. In a study published in Harvard Health Publishing, 2012, it was established that a high caloric intake over time may increase the probability of developing memory loss, or mild cognitive impairment (MCI), later in life [13].

Emotional under-eating and Working Memory

A Pearson's correlation of -0.126 between EUE and Digit Span with a 0.0457 level of significance shows a very weak negative linear relationship between EUE and Digit Span. Earlier researches also support the results of the present study. It has been found that instead of fasting, eating breakfast can influence the cognitive functioning of children including

eating meals of an altered nutritional makeup and the consumption of snacks (Benton, 2008)[1]. Yanakoulia et al, 2004 found an increasing prevalence of dieting with age among boys and girls up to the age of 18 years [14]. Psychologist David Benton noted that children replenished with micronutrient supplements post deficiency displayed a notable improvement in mood, attention span, and memory (2008)[1].

Overall there seem to be a weak relationship between Eating Behavior and Working memory, No significant relationship between variables were found in the present study. Relationships of diet and cognition were also reported in previous researches. Cognitive decline-obesity relationship is multifaceted with the type of memory or the behavioral task as well as the type of dietary intervention (fat, fat and sugar, sugar, and cafeteria diets) involved, studied by Nyugen et al, (2017)[10]. Benton D, 2008 talks about a study which found that in preterm babies the diet of the neonate can have long lasting effects on brain development and cognitive functioning [1]. Understanding the precursors of Emotional Over-eating can prove beneficial for the global epidemic of obesity. Therefore efforts to neutralize obesity may be imperative for protecting one's physical and cognitive health in the short term as well as prevention of serious cognitive disorder in the long-term (Martin and Davidson, 2013)[12]

There are a few limitations of the present study. Due to time constraints the sample size was very small. Moreover the sample size consisted of female students only of the same college. Further researches need to be carried out with a more representative sample. A refined framework can be adopted both for eating behaviour and working memory. Understanding the relationship of eating habits and memory would help prevent developmental cognitive deficits due to food habits. The findings of such researches may help to guide policy makers, who are working in these areas which in turn would help to make efficient intervention programs of cognitive development for the community. If further researches in this line of thought validate the results of the present study, it will be highly beneficial for the community at large

References

- [1] Benton, D. (2008). The influence of children's diet on their cognition and behavior. *European Journal of Nutrition*,47(S3), 25-37. doi:10.1007/s00394-008-3003-x
- [2] Junk food can harm memory. (2004, January 30). Retrieved from <https://www.dailymail.co.uk/health/article-207031/Junk-food-harm-memory.html>
- [3] Wechsler Adult Intelligence Scale | Fourth Edition. (n.d.). Retrieved from https://www.pearsonclinical.com/psychology/products/1000003_92/wechsler-adult-intelligence-scalefourth-edition-wais-iv.html
- [4] David R. Jacobs, Linda C. Tapsell, Food, Not Nutrients, Is the Fundamental Unit in Nutrition, *Nutrition Reviews*, Volume 65, Issue 10, 1 October 2007, Pages 439–450, <https://doi.org/10.1111/j.1753-4887.2007.tb00269.x>

-
- [5] Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(4), 370-396. <http://dx.doi.org/10.1037/h0054346>
- [6] Sigman, M. (1995). Nutrition and child development: More food for thought. *Current Directions in Psychological Science*, 4(2), 52-55.
- [7] <http://dx.doi.org/10.1111/1467-8721.ep10771015>
- [8] Caviness, K. (2019). *The Importance of Nutrition for Cognitive and Physical Well-Being*. [online] Pdfs.semanticscholar.org. Available at: <https://pdfs.semanticscholar.org/e479/da2c3fbc730d66cd23e7f9319f1c07906caf.pdf> [Accessed 30 Mar. 2019].
- [9] Reichelt, C., A., Westbrook, Fred, R., Morris, & J., M. (2017, May 05). Editorial: Impact of Diet on Learning, Memory and Cognition. Retrieved from <https://www.frontiersin.org/articles/10.3389/fnbeh.2017.00096/full>
- [10] Nguyen JCD, Ali SF, Kosari S, Woodman OL, Spencer SJ, Killcross AS and Jenkins TA (2017) Western Diet Chow Consumption in Rats Induces Striatal Neuronal Activation While Reducing Dopamine Levels without Affecting Spatial Memory in the Radial Arm Maze. *Front. Behav. Neurosci.* 11:22. doi: 10.3389/fnbeh.2017.00022
- [11] Bargiota, A., Delizona, M., Tsitouras, A., & Koukoulis, G. (2013). Eating habits and factors affecting food choice of adolescents living in rural areas. *Hormones*, 12(2), 246-253. doi:10.14310/horm.2002.1408
- [12] Martin, A. A., & Davidson, T. L. (2014). Human cognitive function and the obesogenic environment. *Physiology & behavior*, 136, 185–193. doi:10.1016/j.physbeh.2014.02.062
- [13] Harvard Health Publishing. (2012). Over-eating may reduce brain function. Retrieved from <https://www.health.harvard.edu/mind-and-mood/overeating-may-reduce-brain-function>
- [14] Yannakoulia, Mary & Karayiannis, Dimitrios & Terzidou, M & Kokkevi, A & Sidossis, Labros. (2004). Nutrition-related habits of Greek adolescents. *European journal of clinical nutrition*. 58. 580-6. 10.1038/sj.ejcn.1601849.
- [15] Baron, R. A. (2001). *Psychology*(Fifth ed.). Pearson.
- [16] Mallan, K. M., Fildes, A., Garcia, X. D., Drzezdzon, J., Sampson, M., & Llewellyn, C. (2017). Appetitive traits associated with higher and lower body mass index: Evaluating the validity of the adult eating behaviour questionnaire in an Australian sample. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1). doi:10.1186/s12966-017-0587-7
- [17] Hunot, C., Fildes, A., Croker, H., Llewellyn, C. H., Wardle, J., & Beeken, R. J. (2016). Appetitive traits and relationships with BMI in adults: Development of the Adult Eating Behaviour Questionnaire. *Appetite*, 105, 356-363. doi:10.1016/j.appet.2016.05.024
- [18] Allen, J. S. (2012). “Theory of food” as a neurocognitive adaptation. *American Journal of Human Biology*, 24(2), 123-129. doi:10.1002/ajhb.22209
- [19] Lee, A., & Sternthal, B. (1999). The Effects of Positive Mood on Memory. *Journal of Consumer Research*, 26(2), 115-127. doi:10.1086/209554