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A CORRELATIONAL STUDY ON EATING HABITS AND COGNITIVE PERFORMANCE

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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 the direction of the relationship between variables, studied under this research. But 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[17]. The paper discusses the value added nature of food due to our complex interplay of language and culture in our surroundings. As such our eating habits get 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

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(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)[16]. 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 eexcessive body weight has been seen to be linked with deficits in some types of cognitive capabilities throughout lifespan including children and adolescents (Martin 2014)[11].

Working Memory

Earlier Working Memory was used with Short-Term Memory 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)[14]. 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)[9]. 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 –

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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)[16]. 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 was10.11 with a SD(Standard deviation) of 4.789. The mean for EUE was 15.19

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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.

Table 1: Mean and Standard Deviations of EF, EOE, EUE & DS

	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			

Table 2: Correlation between EF & DS

		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**

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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[18]. 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 [12]..

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].

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Yanakoulia et al, 2004 found an increasing prevalence of dieting with age among boys and girls up to the age of 18 years[13]. 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 relationship between variables were found significant 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)[9]. 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)[11]

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 and including other aspects of memory . Understanding the relationship of eating habits and memory would help to 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 , those findings will be highly beneficial for the community at large

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Abstract

This research investigates the relationship between Eating Behaviour and Working Memory through an empirical survey. A convenience sample of 37 female college students, aged 18-21, from Delhi was analyzed using the Adult Eating Behaviour Questionnaire (AEBQ) and the Digit Span subtest of the Wechsler Adult Intelligence Scale (WAIS-IV). Bivariate correlation analysis was employed to explore correlations between Eating Behaviour, categorized into three subtypes: Enjoyment of Food (EF), Emotional Over-Eating (EOE), and Emotional Under-Eating (EUE), and Working Memory. The findings showed a positive correlation between EF and Working Memory, EOE and Working Memory, and a negative correlation between EUE and Working Memory. However, none of the correlations reached statistical significance, suggesting weak relationships. These results warrant further research to determine the strength and nature of these relationships.

Keywords: Eating Behaviour, Working Memory, AEBQ, Digit Span

Introduction

The lifestyle of the 21st century introduces several challenges, with one of the most significant being the impact of diet on cognition. Nutrition, a critical aspect of human development, plays a significant role in shaping cognitive functions across all stages of life (Jacobs & Tapsell, 2007). Research has identified correlations between diet, eating behaviour, and cognitive functioning (Benton, 2008). Theoretical frameworks, such as Abraham Maslow's hierarchy of needs (1943), underscore the importance of fulfilling physiological needs like food before achieving higher-order cognitive processes.

Evidence suggests that junk food and poor nutrition may damage brain functions, including memory (Nguyen et al., 2017). The cognitive framework of eating habits, as described by Allen (2012), suggests that our eating behaviours are shaped by cultural and environmental factors, making them complex cognitive representations.

While studies have indicated relationships between nutrition and cognition, including behaviour in infants (Sigman, 1995), the influence of eating habits on adult working memory is less well-documented. This study aims to fill that gap by exploring the correlation between various eating behaviours and working memory in young adult women.

Eating Behaviour

Eating Behaviour is a multi-faceted construct that can involve various appetitive traits. For this study, we focused on three variables from the AEBQ: Enjoyment of Food (EF), Emotional Over-Eating (EOE), and Emotional Under-Eating (EUE). These constructs provide insights into how individuals emotionally regulate their food intake.

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- **Enjoyment of Food (EF)** measures how much individuals enjoy eating and look forward to meals.
- **Emotional Over-Eating (EOE)** refers to an increased tendency to eat when experiencing negative emotions like anger, anxiety, or sadness.
- **Emotional Under-Eating (EUE)** refers to the opposite – reduced food intake during emotional distress (Hunot et al., 2016).

Emotional eating behaviours have been linked to obesity, cognitive deficits, and poor health outcomes (Martin & Davidson, 2014). Undernourishment in children has been associated with developmental problems and lower cognitive performance (Benton, 2008).

Working Memory

Working Memory is an active, dynamic process, crucial for various cognitive functions, including learning and problem-solving. It differs from short-term memory by including not just the temporary storage of information but also its manipulation and processing (Baron, 2001). Baddely's (1992) model of Working Memory divides it into three parts: the phonological loop, visuospatial sketchpad, and the central executive, which coordinates the other two systems.

Working Memory plays a critical role in attention and cognitive functioning and has been shown to interact with diet in various studies (Nguyen et al., 2017). This study focuses on the relationship between Working Memory, as measured by the Digit Span subtest, and the aforementioned eating behaviours.

Methodology

This study was conducted on a sample of 37 female college students aged 18 to 21 from Delhi, selected through convenience sampling. Data collection tools included the Adult Eating Behaviour Questionnaire (AEBQ) and the Digit Span subtest of the Wechsler Adult Intelligence Scale (WAIS-IV).

- **AEBQ (Adult Eating Behaviour Questionnaire)**: A 35-item self-report questionnaire measuring eight appetitive traits. For this study, we limited our scope to three subscales: EF, EOE, and EUE (Hunot et al., 2016).
- **Digit Span**: A subtest of the WAIS-IV used to assess Working Memory. It includes three tasks: Digit Span Forward (rote learning and auditory processing), Digit Span Backward (working memory and mental manipulation), and Digit Span Sequencing (organization and processing) (Wechsler Adult Intelligence Scale, n.d.).

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Procedure

Participants first completed the AEBQ questionnaire, followed by the Digit Span subtest. The results were processed through SPSS software, and bivariate correlation analyses were conducted to determine the relationships between eating behaviour variables and Working Memory.

Results

The data revealed the following correlations:

1. **Enjoyment of Food (EF)**: A positive Pearson correlation of 0.047 was observed between EF and Digit Span, but the significance level was very low (0.782), indicating a weak relationship.
2. **Emotional Over-Eating (EOE)**: A Pearson correlation of 0.072 was found between EOE and Digit Span, but the significance level of 0.672 suggests no meaningful relationship.
3. **Emotional Under-Eating (EUE)**: A negative Pearson correlation of -0.126 was observed between EUE and Digit Span, with a significance level of 0.457, also reflecting a weak association.

Discussion

This study explored the relationship between Eating Behaviour and Working Memory, with particular attention to EF, EOE, and EUE. Though some correlations were found, none reached statistical significance, indicating a lack of strong relationships.

Enjoyment of Food (EF) and Working Memory: While a positive relationship was observed between EF and Working Memory, it was not statistically significant. Previous research has suggested that positive mood states can enhance learning and memory (Lee & Sternthal, 1999). However, further research is needed to confirm these findings.

Emotional Over-Eating (EOE) and Working Memory: Although previous studies indicate that high-calorie diets can negatively affect cognition (Harvard Health Publishing, 2012), our results did not show a significant relationship between EOE and Working Memory.

Emotional Under-Eating (EUE) and Working Memory: Similarly, EUE exhibited a weak negative relationship with Working Memory, which aligns with studies suggesting that fasting or poor nutrition can impair cognitive functions (Benton, 2008).

The limitations of the present study, including the small sample size and lack of diversity, necessitate further research. Larger, more diverse samples could better clarify the relationship between eating behaviour and cognition.

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Conclusion

The findings of this study suggest that there may be weak correlations between Eating Behaviour and Working Memory, but these relationships are not statistically significant. Future research is required to explore these relationships in more detail, particularly in diverse populations and using larger sample sizes.

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