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RELATIONSHIP BETWEEN SLEEPING AND BMI AMONG YOUNG ADULTS

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Abstract:

The research aims at establishing the relationship between sleeping and BMI of young adults. In the recent years, obesity has become one of the notable issues with a growth rate. Different factors in relation to obesity are being studied to keep the body weight under control. The current research contributes to the healthcare industry and the young adults' populations with its aim of understanding the influence of sleep on the BMI. Review of the past literatures has enabled the current research to acknowledge three significant aspects of sleep; timing, duration, and architect. The research carried on a quantitative analysis over the data collected using the questionnaire method, from a sample size of 589 participants. As per the findings of the analysis, the BMI of young adults is inversely associated with the sleep timing and sleep duration, while a positive association is recognized with respect to sleep architecture.

Keywords: *BMI, sleep, sleep timing, sleep duration, sleep architecture, BMI of young adults*

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INTRODUCTION:

Obesity is one of the most significant health issues in any era. According to a report submitted by the World Health Organization (WHO), there is a significant growth in obesity among individuals between the ages of 19 and 40 around the globe. The growth rate is further expected to increase in the upcoming years (WHO, 2021). A body mass index (BMI) of over 25 can be considered as overweight and a BMI of over 30 is recognized as obese (Peters et al. 2018). Based on the survey recently conducted by the WHO, it was revealed that 1.9 billion adults have a BMI of over 25. It was further found that among the 1.9 billion individuals, 650 million had a BMI of over 30, thus contributing to the percentage of obesity in the overweight category (WHO, 2021). To live a healthy life, it is a necessity to be free of obesity. As such, there arises a need to study the factors that have an influence over the BMI of young adults.

With respect to the need, various works of literature in the past (E.g. Chaput et al. 2006; Beccuti and Pannain, 2011) have identified numerous factors including diet and exercise as factors that have influence over the BMI of an individual. Sleep is one of such factors that have also gained importance in the researches concerning BMI and obesity. Though sleep has been studied as an influential factor of BMI, there are many aspects of the relationship that the researchers are yet to divulge. For instance, the position of the body as an individual lies asleep may have an influence over the digestive process, thus making an impact on the BMI of that individual (Lee et al. 2015). Like so, there are multiple speculations with respect to the nature of the relationship between sleep and the changes in the BMI of an individual. The current research attempts to ascertain the truth by establishing the relationship between sleeping and BMI among young adults.

However, over the recent decades, numerous studies have been dedicated to identifying the relationship between sleeping and BMI (E.g. Grandner et al. 2015 and Miller et al. 2015). Though some of those studies have argued about the aspects of sleeping, the extent of information revealed is still low. Hence the current study intends to stand unique among those works of literature by focusing on different aspects of sleeping with respect to young adults. Specifically, the study concentrates on three aspects; sleep timing, sleep duration, and sleep architect. Sleep timing is related to the time when an individual goes to sleep. Sleep duration, on the other hand, refers to the amount of time that an individual may spend for sleep. Finally, sleep architecture points to different phases and depths of sleep incurred by the individual. These three aspects are taken into consideration as they may have an impact on the metabolism rate of individuals which is closely linked to the changes in the bodyweight of the individual (Morrissey et al. 2020). In this regard, the aims and objectives of the current study are framed as follows.

AIMS AND OBJECTIVES:

The aim of the study is to reveal the relationship between sleeping and BMI of young adults. The following objectives are hoped to be achieved in relation to this purpose.

- To identify the relationship between sleep timing and BMI of young adults
- To identify the relationship between sleep duration and BMI of young adults
- To recognize the relationship between sleep architecture and BMI of young adults

Literature review:

Nuttall (2015) refers to BMI as the value arrived at by matching the body weight of an individual against the height of the individual. The formula for BMI is Kilogram/Metre^2 (Kg/m^2). A number of previous works of literature have stated that the appropriate BMI for an individual is between 25 and 30. If the BMI is more than 30, an individual is termed as obese while an individual below 25 could be regarded as underweight (Rothman, 2008; Adab et al. 2018). It goes on to show that BMI as a measurement plays a vital role in recognizing the obesity of an individual. In accordance with a study carried on by Emmerzaal et al. (2015), various controllable factors including eating habits, exercise routine, and living style of the individuals have a significant effect on the changes in BMI of an individual. In agreement with the statement, Locke et al. (2015) stressed the need to identify all the influential factors of BMI on young adults as there is notable growth in the rate of obesity among young adults in the current era, unlike ever before. In this regard, some of the previous literatures have recognized sleep as the most influential factor in the BMI of young adults. According to Grandner et al. (2015), sleep has the capability to make an impact on the bodyweight of individuals, since the functions of a body at the time of sleeping differ in comparison to the time when an individual is awake.

For instance, Miller et al. (2015) have related sleep timing to BMI of the individuals in research and stated that individuals with uneven or inconsistent sleep timings are prone to health issues such as obesity. Following the claim, Arora and Taheri (2015) further stated in a study that late sleepers are prone to gaining more BMI than individuals who go to bed early. As

late sleepers consume food lately as well, they suffer from low metabolism during sleep. Additionally, Kahleova et al. (2017) also pointed out those late sleepers often gets up early, thus deprived of enough sleep. As a result, they feel sleepy the whole day, which in turn slows down their metabolism, causing them to gain more bodyweight.

In another study carried on by Fatima et al. (2016), the importance was placed on sleep duration. It was found that individuals who sleep for 6 hours or less per day gain body mass, thus leading them to become obese. In terms of comparison, Jalali-Farahani et al. (2016) claimed that sleep duration causes more impact on the BMI of individuals than sleep timing since it eventually comes down to sleep deprivation. Accordingly, Zhao et al. (2018) has stated that the individuals who have had an appropriate amount of sleep, despite the difference in their sleep timing may have low BMI compared to those who have slept for less than the appropriate sleep duration. Relating to this statement, Koskimäki et al. (2018) refer to an appropriate sleep duration as a continuous period of 6 hours to 8 hours. In other words, Koskimäki et al. believe that less than 6 hours of sleep, an insufficient amount of sleep.

On the other hand, with respect to sleep architecture, Roche et al. (2018) have found through a study that slow-wave sleep (SWS) in which an individual enters the final phase of a non-rapid eye moment (NREM) sleep, is inversely associated with BMI, thus helping to reduce obesity in the individuals. In agreement, Sever et al. (2019) establish a relationship between the sleep architecture and the weight gain of an individual aside from the duration of the sleep and sleep timing. Sever et al. found that the metabolism rate increases when the muscles are completely relaxed. In an earlier study on NREM, Spaeth et al. (2017) pointed out when an individual enters the third or final phase of the NREM sleep, there is slow breathing and a drop in the blood pressure that causes the muscles to relax. As the final stage of NREM lasts about 20 to 40 minutes, Wichniak et al. (2017) claim that more than sleep duration and sleep timing, a few hours of deep sleep may increase the metabolism rate, causing the BMI to drop.

Contrary to the claims, various works of literature have stated that the relationship between sleep and obesity is overstated. Epstein et al. (2012) pointed out that while obesity or an increase in BMI may have an impact on the sleeping aspects of an individual, the sleeping habits do not have any notable influence over the BMI of the individuals. In agreement, Martins et al. (2015) further stated that the factors such as eating healthy and exercising have a more direct influence over the obesity of an individual rather than sleep. In a study related to BMI of lean individuals, Kim et al. (2017) stated that the sleep timing and duration had less effect on the accumulation of body fat and hence sleep may not have any influence over BMI and obesity. Furthermore, in another study carried on by Kapoor et al. (2017), it was put forward that sleeping and BMI should be recognized as dependent factors rather than discerning one factor as a dependent of another. Haidar et al. (2018) responded by stating that a healthy lifestyle inclusive of an exercise routine, consumption of healthy food, and healthy habits may be considered as independent factors capable of influencing the dependent factors; BMI and sleep. In this regard, the current study could consider the relationship between sleeping and BMI, with the lifestyle of the young adults remaining constant.

To discern the relationship between sleep and BMI, an analysis will be conducted in accordance with the following methodology.

METHODOLOGY:

Research philosophy:

The research follows positivism philosophy that insists on taking into consideration only the factual knowledge gained through observations (Ryan, 2018). By following the positivism philosophy, the researcher takes on an objective perception, where findings are observed and quantified rather than interfered with. Subjective perception is restricted as the current study is intent on taking a scientific stand with respect to BMI and sleep, rather than a social stand which can be influenced by the participants and the researchers (Park et al. 2020). The research approach is to be selected in accordance with the research philosophy.

Research approach:

The research adapts a quantitative research approach that utilizes mathematical and statistical tools to identify patterns and relationships between variables and quantify them (Allwood, 2012). The proposed study considers the quantitative approach as it can intake and process a large amount of data and offers reliable and repeatable information. Qualitative research would assist in revealing the underlying meaning behind a subject or phenomenon, but it cannot be employed on a large sample size since it requires a subjective perception and interpretivism philosophy for effective functioning but which is time-consuming and expensive (Quick and Hall, 2015). Furthermore, the quantitative research approach proves to be more suitable for scientific researches,

where an objective perception is required. Hence, the current study employs a quantitative research approach.

Research design:
A cross-sectional study is adopted as the quantitative research design for the proposed study. The cross-sectional study helps in analyzing data from a targeted population during any particular period of time and recognizing the patterns between two or more variables (Olsen and St George, 2004). Through a cross-sectional design, the researcher observes the social reality and generalizes the observed patterns through surveys. Using the cross-sectional design, the current study attempts to recognize the patterns between the variables; sleep and BMI of young individuals.

Sampling and data collection:
The study makes use of primary data collected through survey method from random individuals meeting the following criteria

1. 19 to 40 years of age
2. Must not be taking any medication
3. Must not be taking any supplements for weight gain

Under the survey method, the questionnaire contains the questions relating to three major factors; sleep timing, sleep duration, and sleep architecture. The sample size has been set at 200. The samples are divided into two groups of 100 each; below 30 BMI and above 30 BMI. The study approached the participants through email via a snowball effect (Perez et al. 2013). In other words, the researcher will send an email containing a link for the questionnaire to a few known participants meeting the criterion, who would, in turn, send the mail to individuals in their contacts.

Method of analysis:
The responses from the participants were collected and analyzed using the SPSS tool. With help from SPSS, the responses are grouped and defined using statistical means. As per the cross-sectional study, the nature and level of influence of the different aspects of sleep on the changes in the BMI of individuals will be revealed. Above 30 BMI are regarded as overweight individuals and their data are compared against the individuals under the 30 or less BMI to understand the effects of sleeping on the changes in BMI. The sleep timing, duration, and architecture represent the different aspects of sleeping and as such, they will be regarded as the independent variables that can vary between the participants. On the other hand, the BMI of the young adults are regarded as the dependent variable which is measured with respect to the changes in the independent variables; sleep timing, duration, and architect.

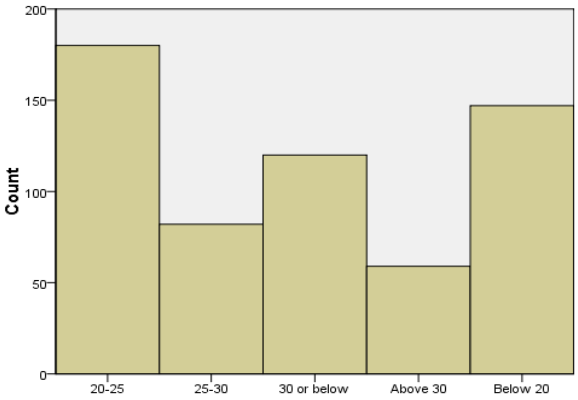
RESEARCH QUESTIONS:

- To what extent does sleep timing differs between young adults of BMI below 30 and BMI above 30?
- To what extent does sleep duration differs between young adults of BMI below 30 and BMI above 30?
- To what extent does sleep architect differs between young adults of BMI below 30 and BMI above 30?

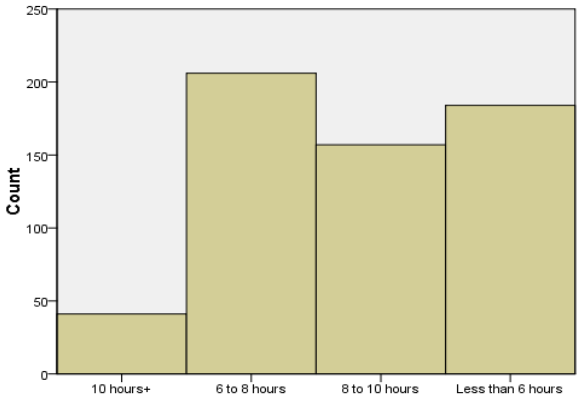
RESULTS AND ANALYSIS:

Among the total number of participants, 48.2% were female and 51.8% were male. As the ratio is almost equal, it is believed that the distribution would not have an influence over the results of the research. With respect to the age group, the target age group of young adults which is between 19 and 40 years of age stands at 28.9% of the total number of participants. Furthermore, over 2/3rd of the individuals considered for the research are taking medications for sleeping and supplements for weight gain. This may have a strong impact on the results of the research. The research will counter the effects by focusing on the aspects of the sleep and BMI.

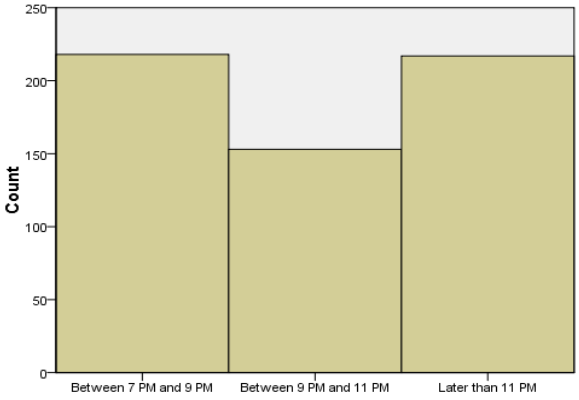
Aspect	Category	Percent	Cumulative Percent
Gender	Female	48.3	48.3
	Male	51.7	100
Age	Between 19 and 40	28.9	28.9
	Less than 19	32.1	61.1
	More than 40	38.9	100
BMI	20-25	30.6	30.6
	25-30	13.9	44.6
	30 or below	20.4	65
	Above 30	10	75
	Below 20	25	100
Sleeping time	Between 7 PM and 9 PM	37.1	37.1
	Between 9 PM and 11 PM	26	63.1
	Later than 11 PM	36.9	100
Hours of sleep	10 hours+	41	7
	6 to 8 hours	206	42
	8 to 10 hours	157	68.7
	Less than 6 hours	184	100



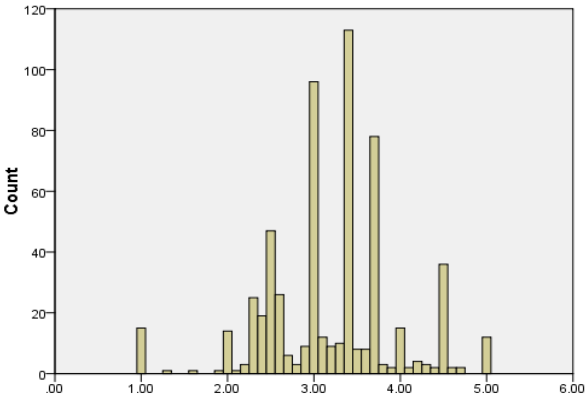
What is your body mass index (BMI)?



How many hours of sleep do you get?



At what time do you go to sleep?



Among the selected participants, the majority amounting to 30.6% has a BMI of below 25. The percentage of participants with BMI of over 30, stands at 20.4. These are the main participants considered for the current research. In terms of fitness routines, it seems majority of the participants do not follow such routines. From the responses it was also identified that about 35.3% of the population have smoking habits. This may disrupt the results of the study. 37% of the participants go to sleep between 7 and 9 PM. The percentage remains the same for those who sleep later than 11 PM. High number of such participants wakeup later than 8 AM.

Linear Regression Results of Relationships

R-value	0.438	
R-Square	0.192	
P-value	0.00	
F-value	46.290	
	Beta Coefficient	**P-value**
(Constant)	2.260	.000
SLEEP TIME	-.497	.000
SLEEP DURATION	-.476	.000
SLEEP ARCHITECTURE	.803	.000

The R-value of the regression (0.438) which indicates that the correlation is moderately strong and positive and the R-square (0.192) indicates that the variations in the dependent variable BMI can be predicted to an extent of 19.2% with the help of the following variables. The sig value of the regression analysis is 0.00, which indicates that the variables considered are statistically significant relationship between the variables. The study found that the variable "SLEEP TIME", which is the measure of the time that the sample goes to sleep affected the BMI negatively with the coefficient being (X1=-.497; P=0.00). In other words, the BMI of the samples who goes to sleep late tend to have higher BMI as per the analysis and the relationship is statistically significant. The study found that the variable "SLEEPDURATION", which is the measure of the number of hours that the sample slept affected the BMI negatively with the coefficient being (X2=-.476; P=0.00). In other words, the sample that sleeps less tends to have lesser BMI and the following relationship is clearly proven as the statistically significant relationship. And finally, the variable "SLEEP ARCHITECTURE", which measures the sleep architecture of the samples tend to have a positive effect on the BMI (X3=.803; P=.000), which indicates that the BMI of the samples tend to increase based on the sample's sleeping position and the relationship is statistically significant.

DISCUSSION:

In this chapter, the findings from the analysis are discussed in relation to the works of literature reviewed earlier. The analysis showed an inverse relationship between sleep timing and BMI of young adults. In other words, the young adults who sleep late at night had a higher BMI than those who goes to bed earlier. The finding stands parallel to the findings of the study carried on by Arora and Taheri (2015) which claimed that late sleepers are prone to gaining body weight. The sleep timing further had a relationship with the sleep duration of the young adults as it was stated by Kahleova et al. (2017). In addition to this, the findings from the analysis of the current research showed a negative relationship with the BMI of the young adults taken into consideration for the analysis. The participants who slept for less than 6 hours and those participants who slept for more than 8 hours had more BMI than those who slept for a duration of 6 hours to 8 hours. This finding also stands in agreement with the statement provided by Fatima et al. (2016) according to which there is a high possibility for the individuals who slept for more than 6 hours to gain more body mass. Another notable finding of the current analysis was that the sleep architecture of young adults has a positive relationship with their BMI. As the young adults enter into the final phase of the NREM sleep where they have a deep sleep, they are still prone to obesity or an increase in BMI. This finding stands in contrast to the findings of Roche et al. (2018) in the literature review, where it was stated that sleep architecture and BMI have an inverse relationship. The contrast may have arisen owing to the difference between the participants taken into consideration by the studies.

RESEARCH ETHICS:

As per the research ethics, the consent of the individuals participating in the research were received before their participation. The researcher also made them aware of the purpose of the research for which the data of the participants were to be utilized, before gathering such data. The researcher made a statement

in the consent form promising that the data provided by the participants will not be used for any other purposes. In addition to this, the anonymity of the participants has also been promised to be safeguarded by the research. With respect to previous works of literature, the proposed research has properly acknowledged the authors through citations and bibliographies, thus ensuring its genuinity.

RECOMMENDATIONS:

The Healthcare industry can utilize the results of the research and accordingly deliver medical advice to patients who suffer from obesity. A sleeping schedule in addition to the daily routine or diet could be added to a young adult patient who is in the initial stages of obesity, where the BMI is close to but over 30. In addition to this, the parents can utilize the results of the current research to condition the sleeping patterns of youngsters. Young age is perfect for creating new habits that could continue on even after becoming an adult. As such, by conditioning the sleeping patterns of the youngsters, their parents can control the accumulation of the body, thus preventing them from incurring obesity problems. The results from the research have shown that an individual control oversleeping architecture is low in comparison to sleep timing and duration. It is recommended to the young adults that they attempt to burn more calories during their daytime, so as to gain a deep NREM sleep that allows them to control their metabolism at night. The impact of sleep architecture on the BMI of young adults remains to be fully explored. Future researchers are recommended to take the current study and its results and further explore the relationship between sleep architecture and BMI.

CONCLUSIONS:

The research aimed at establishing a relationship between sleep and BMI of young adults. In particular, the research attempted to understand the impact of different aspects of sleep including the timing, duration, and architecture on the changes in the body mass of young adults. Based on the analysis and discussion, it can be concluded that sleep timing and sleep duration have a stronger inverse relationship with BMI of young adults than the sleep architecture. The analysis showed that compared to late sleepers, the early sleepers had a low BMI. Similarly, with respect to sleep duration, it was revealed through the analysis that the individuals who had slept for 6 to 8 hours gained less body weight than the individuals who had slept for fewer hours. With respect to the sleep architecture, the relationship was not strong as in the case of the other two variables. However, the analysis revealed a positive relationship between sleep architecture and BMI. In other words, when the young adults go into a deep sleep, the metabolism to work on calories consumed by them is also relaxed, thus allowing the gain of BMI among the young adults. By considering the different aspects as representative of sleep, it can also be concluded that sleep has a strong relationship with BMI of young adults.

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