Caffeine and Sleep Quality as Covariant of Academic Performance among Undergraduate Biology Education Students: Counselling Intervention.

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Abstract

Determine relationship between moderate consumption of caffeine and high academic performance among undergraduate biology students was among the objectives of the study. Correlational design was adopted as the design for this study. The population of the study constitutes 481 biology education undergraduate students from the Faculty of Technology Education. A proportionate stratified sampling technique was employed in selecting 196 students as sample participants in this study using Research Advisor table for determining sample size. Two instruments were used for this study as thus; one Pittsburgh Sleep Quality Index developed by Buysse, Reynolds, Monk, Berman and Kupfer in 1989 was adopted for this study, and two a self designed questionnaire titled "Caffeine and Academic Performance Inventory (CAPI)" were used respectively for data collection in this study. The scales have a coefficient reliability index of 0.83 and 0.80 respectively. Hypothesis was formulated and tested at α 0.05 level of significance. The data were analysed using mean, standard deviation and Pearson Product Moment Correlation Coefficient. Findings from the study showed that there was a significant relationship (r-value=.973** as against P-value = .000) between moderate sleep quality and academic performance of biology education undergraduate students. However recommendations offered a need to sensitize study skills and group discussion among the students; this will go a long way in assisting them to learn and understand the basic rudiments of good academic performance in tertiary institutions.

Key words: Caffeine, Caffeinated beverages, Sleep quality, Academic performance.

Introduction

Students in the Biology Education Unit at the Faculty of Technology Education (FTE) of Abubakar Tafawa Balewa University (ATBU), Bauchi, desire to excel in courses they registered each semester. This is likely to make most of them to spend more than half of their nights reading. The students strive hard to keep awake, this action may likely lead them to take caffeinated beverages to assist them keep awake, and this could be coffee, tea, soft drinks such as coca-cola and cola nut. Caffeine ingested into the body can induce relieve, prevent drowsiness, reduces fatigue, increase central nervous stimulant and alertness. It improves reaction and motor co-ordination (Tutor Doctor, 2014). Moderate dose of caffeine delays or prevent sleep and improve tasks performance for about three to four hours. The moderate dose according to Hershness and Chervin (2014) is the consumption of about 200 to 300 milligrams a day. It also remains in one's system for six to eight hours (Owens, Mindell & Baylor, 2014). caffeine begins to affect your body very briskly. It reaches a peak level in your blood within 30 to 60 minutes, it has a half life of 3 to 5 hours (Heffron, 2013). Olsen (2013), posited that caffeine in human body can range from 25 to 12 hours because of genetic differences, some metabolize caffeine more quickly than others.

Thus, sleep is an integral human function that allows the brain to consolidate memory and muscles to relax. Sleep deprivation or poor sleep can affect memory, judgment and mood. Hershnes and Chervin (2014) stressed that sleep deprivation can result in lower grade point, increase risk of accident, compromised learning and impaired mood. Students ingest caffeine to improve academic performance, but this resulted to poor sleep quality. Owens, Mindell & Baylor (2014) posited that university students should ideally get eight to nine hours sleeps a night. This shows caffeine and sleep quality plays a role in learning and academic

performance. Caffeine may not always have positive effect for students hoping to improve academic performance. Any prolong sleep deprivation is likely to affect the mood, energy level and ability of the students to focus, concentrate and learn which directly affect academic performance. Heffron (2013) prescribed the amount of caffeine for an adult is 200 -300 miller grams each day which is equal to 2 to 4 cups of coffee.

Objectives of the study

The following objectives were set to give a focus to the study as thus:

1. To determine relationship between moderate consumption of caffeine and high academic performance.
2. To determine relationship between high consumption of caffeine and low academic performance
3. To determine relationship between sleep quality and academic performance

Research Questions

1. What is the relationship between moderate take in of caffeine and high academic performance?
2. What is the relationship between high take in of caffeine and low academic performance?
3. What is the relationship between sleep quality and academic performance?

Hypotheses

The following hypotheses were postulated to give a guide to this study as thus:

1. There is no significant relationship between moderate consumption of caffeine and high academic performance.
2. There is no significant relationship between high consumption of caffeine and low academic performance.
3. There is no significant relationship between sleep quality and academic performance.

Design Research

Cross sectional correlational design was employed for this study. The justification for the use of this design was to indicate the magnitude of the relationship between caffeinated beverages, sleep quality and academic performance. The design is use to indicate the appropriateness in determining whether two or more variables are related (Awotunde & Ugodulunwa, 2004).

Population and Sample Size

The population of this study consisted of 481 male and female Biology Education students of Department of Science Education, Faculty of Technology Education, Abubakar Tafawa Balewa University, Bauchi. A sample of 196 was drawn using the table for determining sample size (Research Advisor, 2006). The proportionate stratified sampling technique was used in drawing the sample from 100 levels to 500 level students of biology education studying in academic session of 2017/2018. The population and sample size is shown in table 1 as thus:

Table 1:   **Sample Size of the Population**

S/no	Variables	Population	Sample	Percentage
1	100 level	121	49	25%
2	200 level	129	53	27%
3	300 level	91	37	19%
4	400 level	91	37	19%
5	500 level	49	20	10%
	Total	481	196	100%

Field work 2018

Instrumentation

Two instruments were used for this study as thus; one, Pittsburgh Sleep Quality Index developed by Buysse, Reynolds, Monk, Berman and Kupfer in 1989 was adopted for this study. It is a 19 items scale that measure global self-report of sleep quality. The scale is believed to be one-dimensional. All items were answered using a 5-point Likert scale. The instrument has a reliability coefficient index of 0.83. The rationale for adopting this instrument was it was the most widely used of global self-report on sleep quality. This instrument was used in measuring the sleep quality of the students while, the second instrument 'Caffeine and Academic Performance Inventory' (CAPI) was developed by the researchers and used in the study. The questionnaire was

divided into two sections A and B respectively, while section A dealt with personal information of the respondents. Section B contained 20 items on modified four Likert type scale ranging from strongly agree to strongly disagree. Of the 20 items 3, 5, 7, 10, 11, 15, 18 and 20 were negative responses and the rest items were positive. While the maximum score is 80 marks, the minimum is 20 marks. The total score for each item was taken as the index assessment for relationship between caffeine consumption and academic performance of biology education undergraduate students. The mean score of 3(m=3) and above for each scored item indicated agreement or acceptance with the statement on the item, while mean score less than three (3) is disagreement or rejection of the statement on the item. A sample of 100 respondents was drawn and pilot tested from two different tertiary schools outside the target institution within Bauchi LGA. Initially the questionnaire contained 30 items of which 10 items were rejected during the validity. A reliability index of 0.80 was obtained using Cronbach's Alpha.

Procedure for Data Collection

The validated questionnaires Pittsburg Sleep Quality Index and (CAPI) were distributed to 196 sampled students selected from Biology Education Unit of ATBU, Bauchi. Out of the 196 questionnaires distributed the sum of 187 (95.4%) were returned, while 9 (4.6%) were not returned. The returned questionnaires were thereafter marked and scored in order to determine the relationship between caffeine and academic performance and sleep quality and academic performance.

Procedure for Data Analysis

The Pearson Product Moment Correlation Coefficient (PPMCC) was employed to test the three null hypotheses in the study. The justification for using PPMCC was because the variables are in the interval scale of measurement. It is also useful for determining the strength and direction of relationship between two variables either as negative or positive (Punch, 2001). Again, correlation coefficient (r) takes range between -1.000 to +1.000 that describes the strength of relationship between the two variables that were compared by the study.

Results

The hypotheses were tested at 0.05 level of significance, the results were as follows:

Ho_1: There is no significant relationship between moderate consumption of caffeine and high   academic performance among biology undergraduate students.

The hypothesis was tested using PPMCC and the result is presented in table 2.The descriptive information result for the hypothesis was analysed using PPMCC and the mean scores were one: (N=350(92.60%), M=60.00, SD=10.02) and (N=350 (92.60%) M=19.82, SD=10.02).

Table 2: PPMCC analysis of relationship between moderate caffeine consumption and high academic performance.

Variables		Moderate Caffeine Consumption	High Academic performance
Moderate Caffeine	Pearson correlation	1	.973**
Consumption	Sig (2-tailed)		.000
	N	187	187
High Academic Performance	Pearson correlation	.973**	1
	Sig (2-tailed)	.000	
	N	187	187

Correlation is significant at 0.05 level (2-tailed)

There was positive relationship between the two variables (r=.973**, n=350, p < 0,05) with moderate level of caffeine consumption associated with high level of academic performance. This indicates that there is a high positive academic performance and moderate consumption of caffeine among undergraduate students. It means moderate consumption of caffeine influences high level of academic performance.

Ho_2: There is no significant relationship between high consumption of caffeine and low   academic performance among biology education students.

The hypothesis was tested using PPMCC and the result is presented in table 3. The descriptive information result for the hypothesis was analysed using PPMCC and the mean scores were one: (N=350(92.60%), M=55.02, SD=9.98) and (N=350 (92.60%) M=24.97, SD=9.99).

Table 3: PPMCC analysis of relationship between high consumption of caffeine and low academic performance

Variables		High Caffeine Consumption	Low Academic Performance
High Caffeine Consumption	Pearson correlation	1	.1000**
	Sig (2-tailed)		.000
	N	187	187
Low Academic Performance	Pearson correlation	.1000**	1
	Sig (2-tailed)	.000	
	N	187	187

Correlation is significant at 0.05 level (2-tailed)

There was positive relationship between the two variables (r=.1000**, n=350, p < 0,05) with high consumption of caffeine influence, associated with low level of academic performance among the students. This indicates that there is a high positive consumption of caffeine and which leads to low academic performance among biology education undergraduate students. It means high consumption influences low level of academic performance.

Ho₃: There is no significant relationship between sleep quality and academic performance among undergraduate biology students.

The hypothesis was tested using PPMCC and the result is presented in table 4. The descriptive information result for the hypothesis was analysed using PPMCC and the mean scores were one: N=350(02.60%), M=52.01, SD=6.50) and N=350 (92.60%) M=29.97, SD=6.54).

Table 4: PPMCC analysis of relationship between sleep quality and academic performance.

Variables		Sleep Quality	Academic Performance
Sleep Quality	Pearson correlation	1	.997**
	Sig (2-tailed)		.000
	N	187	187
Academic Performance	Pearson correlation	.997**	1
	Sig (2-tailed)	.000	
	N	187	187

Correlation is significant at 0.05 level (2-tailed)

There was positive relationship between the two variables (r=.997**, n=350, p < 0,05) with moderate sleep quality associated with high level of high academic performance. This indicates that there is a moderate positive sleep quality can influence high academic performance among biology education undergraduate students. It means moderate sleep quality influences high level of academic performance.

Discussion

From the analyses of data collected and the hypotheses tested. It was discovered in hypothesis one that there was a high positive relationship existing between moderate caffeine consumption and high academic performance. This reason attributes to the students who consumed caffeine experienced improvement in their motor skills and energy that allows them to read for a longer period than the non consumers of caffeine. Thus, it was stated by many findings that caffeine do not increase any mental alertness but rather it increase energy to the body that enables it perform rigorous activities for a prolong time. Treanor (2014). In his findings revealed that caffeine do not increase any mental alertness, it only improve motor skills among consumers. It therefore do not increase any academic performance. This finding is similar to the findings of Owens, Mindell and Baylor (2015) who reported that over 7000 participants believed that a significant proportion of the variance in academic achievement was attributed to caffeine use. In hypothesis two it was revealed that there was a significant relationship between high consumption of caffeine and low academic performance. It was discovered among participants who consumed higher percentages of caffeinated drinks developed some attributes such as morning tiredness, restless, decrease sleep hours, lack of attention and dizziness that affect their concentration in class thereby leading them to low performance. This finding coincides with Watson, Banks and Kohler (2017) who posited that shorter sleep is associated with greater caffeine consumption. In addition to this Pattison, Rusin and Bai (2016) reported that decrease in sleep hours can be caused by increase in caffeine consumption and correlate to negative academic performance. In a similar vein Thatcher (2017) reported that two-third of the students who had pulled at least all-nighter during a semester and that those who do it regularly had lower GPAs. In the third hypothesis it was discovered that there was a significant relationship between sleep and academic performance among undergraduate students. Students who had adequate regular sleep daily score higher in their tests while those students who experienced poor sleep score low in their tests. This finding is similar to that of Thatcher (2007) who reported that students who had regularly pulled at least one all-nighter during a semester had lower GPAs. While El-desouky, Lawend, and Awed

(2015), discovered that students with good sleep quality have good academic scores. In the same vein Gilbert and Weaver (2010) revealed that poor sleep quality is associated with lower academic performance for nondepressed students.

Counselling Intervention

The counsellor is a psychological engineer, who has the knowledge of intervening between the client's study habits that destabilized him/her by designing a therapeutic programme. Counselling is the best talking therapy, which is ideal for students who are basically healthy, but need to be helped with coping skills to reduce their current anxiety as regard their study in the tertiary institutions.

However the main concern of counselling is to make an individual think more positively about ability and disability in life and free him/her from unhelpful patterns behaviour caused by anxiety and voluminous academic activities faced by students. This can be done by setting and guiding the client towards better reading strategies by his/her therapist. The client maybe asked to adapt any or combination of the strategies out of many for use in the cause of his/her studies. This will help in reducing their dependence on any caffeinated beverages.

Obviously, intervention is emergence and temporary care given by the counsellor to the client because of an unusual behaviour due to low academic performance that rendered the client a failure. The priority of the intervention and counselling is to increase performance and stabilization of the students in studying by balancing their time for both leisure and academics, right from the beginning of the semester. The intervention is given in form individual or group counselling.

Conclusion

Conclusion drawn from this study indicated the relationship between caffeinated beverages, sleep quality and academic performance among undergraduate biology education students. Adopted instrument together with a self structured questionnaire were used to obtain the data for the study. Sample of 196 students were used. Findings from the study indicated that there was a high positive academic performance and moderate consumption of caffeine among undergraduate students, there is a high positive consumption of caffeine and low academic performance among biology education undergraduate students. It indicated a high consumption influences low level of academic performance. Although the study was limited to only biology education unit in the Faculty, there is a need for similar study with other units and departments in the Faculty.

Recommendations

Based on the findings of this study, the following recommendation is put forward:

1. There is a need to sensitize study skills and group discussion among the students; this will go a long way to assist them to learn and understand the basic rudiments in studying at the tertiary institution
2. Biology education students should be educated the need for adequate sleep and its contribution to academic performance.
3. Sufficient daily sleep may have an impact on their general physical, psychological an physiological wellbeing of the students.

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