Acta Scientific Ophthalmology (ISSN: 2582-3191)

Volume 5 Issue 3 March 2022

Research Article

Effect of Caffeine (Coffee) on Blink Rates of Adults During Conversation

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Received: January 01, 2022

Published: February 09, 2022

Abstract

Purpose: To determine the effect of caffeine on blink rate of adults

Method: A total of 100 subjects aged 18 - 50 years participated in the study. The subjects were allowed to rest for 5 minutes and then conversed for 1 minute during which the subjects talked with the researcher on general issues to make for relaxation. The number of blinks per minute was noted and recorded. After which the subjects were given 1.5 grams of Nescafe coffee powder, mixed with 50 millilitres of water, under room temperature. Each subject drank the coffee drink comfortably and the exact time of coffee intake noted. Number of blinks at 15 minutes was taken after each subject consumed Nescafe coffee. Blink rate was taken for each subject at 30, 45 and 60, minutes after coffee consumption.

Results: Mean baseline blink rate was 16.17 blink/min. 15 minutes post consumption of coffee, mean blink rate decreased to 14.00 blink/min. 30 minutes post consumption of coffee, mean blink rate decreased to 12.89 blink/min. 45 minutes post consumption of coffee, mean blink rate further decreased to 11.03 blink/min. Mean blink rate at 60 minutes post consumption of coffee was 14.84 blink/min.

Conclusion: This study showed that caffeine significantly decreased blink rate during conversation. Blink rate at 60 minutes was noted to be gradually returning to baseline blink rate. This suggests that the effects if caffeine on blink rate in adults may last for an hour before it gradually diminishes. This study also compared the effect of caffeine based on gender and found no significant difference between blink rate in both sexes. However, there was an effect in respect to age. Older people had a significantly decreased blink rate after consumption of coffee with respect to time.

Keywords: Caffeine; Adults; Blink Rate

Introduction

Caffeine, a central nervous system stimulant, is arguably the most frequently ingested pharmacologically active substance in the world [1]. Occurring naturally in more than 60 plants, including coffee beans, tea leaves, cola nuts, and cocoa pods, caffeine has been part of innumerable cultures for centuries. But the caffeine-in-food landscape is changing from jelly beans to syrup, and even bottled water, the array of new caffeine-containing energy products, including energy drinks and supplements entering the market place. Years of scientific research have shown that moderate consumption by healthy adults of products containing naturally occurring caffeine is not associated with adverse health effects [2]. But the changing caffeine landscape raises concerns about safety and whether any of these new products might be targeting populations not normally associated with caffeine consumption, namely, children and adolescents, and whether caffeine poses a greater health risk to those populations than it does to healthy adults.

Blinking is a semiautomatic rapid closing of the eyelid. A single blink is determined by the forceful closing of the eyelid or inactivation of the levator palpebrae superioris and the activation of the palpebral portion of the orbicularis oculi, not the full open and close.

The blinking rate is determined by the blinking center in the central nervous system which has the possibility of been influenced by the consumption of several food as well as chemical substances including caffeine.

Background information

Pharmacology of caffeine

Caffeine stimulates the central nervous system first at higher levels, resulting in increased alertness and wakefulness, faster and clearer flow of the thought, increased focus and better general body coordination and later at the spiral cord level at higher doses [3].

Metabolism

Caffeine is completely absorbed by the stomach and small intestine within forty-five minutes of ingestion. After ingestion it is distributed throughout all tissues of the body and is eliminated by first order kinetics [4].

In women taking oral contraceptives, caffeine half life increased to 5-10 hours [5] and in pregnant women, the half-life is roughly 9-11 hours [6]. Caffeine can accumulate in individuals with severe liver disease and its half-life can increase to 96 hours [3]. In infants and young children, the hall-life may be longer than in adults, its half-life in a new born baby may be as long as thirty hours. Other factors such as smoking can shorten caffeine's half-life [7].

Mechanism of action

Caffeine action is thought to be mediated via several mechanisms, the antagonism of adenosine receptors, the inhibition of phosphodiesterase, the release of calcium from intracellular stores, and antagonism of benzodiazepine receptors [8].

Caffeine and adenosine receptors

The ability of caffeine to inhibit adenosine receptors appears to be highly important in its effects on behavior and cognitive function. This ability results from the competitive binding of caffeine and paraxanthine to adenosine receptors and is of importance in contributing to CNS effects, especially those involving the neuromodulatory effects of adenosine. Due to the blocking of adenosine inhibitory effects through its receptors, caffeine indirectly affects the release of norepinephrine, dopamine, acetylcholine, serotonin, glutamate, gamma-aminobutyric acid (GABA), and perhaps neuropeptides [9].

Types of blinks

There are different types of eye blinks and they are based on the stimuli or origin of the eye blink [10]. These include:

- Reflex Blinks (in response to something invading the eye). They are instinctive responses that guard the eyes against air puffs and dust. They are also part of the startle response to loud noises.
- Voluntary Blinks (as a result of a decision to blink) they include squinting and winking. They are under conscious control. Applications of voluntary blinking include their use as signals for communicating when diseases such as Acquired Immune Deficiency Syndrome, multiple sclerosis, muscular dystrophy or Alzeimer's disease have made other forms of communication impossible.
- Spontaneous/Endogenous Blinks (due to perception and information processing). Endogenous means it originates from or due to internal cause. This blink occurs during reading or speaking and reflect changes in attention and changes in thought processes. This is the interest of this study.

Origin and physiology of blinking

It is often assumed that blinking is a reflex initiated by cornea dryness but for spontaneous blinking this is not so [11]. Blinking occurs with no external stimulus rather, it is mediated by signal from the brain. Spontaneous eye blinking is determined by the activity of a "blinking center" in the globus pallidus of the caudate nucleus. The influences of the superior colliculus in the neuronal circuits of the blink reflex also have been demonstrated by a study [12] on monkeys. There is a strong association between blinking and the action of the extraocular muscles. Eye movement is generally accompanied by a blink and it is thought that this aids the eye in changing their fixation point. Spontaneous blinking has revealed the reciprocal innervations between the levator palpebrae superioris and orbicularis oculi muscles [13]. Immediately before a blink the activity of the levator palpebrae muscles ceases, whereas the orbicularis Ocular motor neurons produce a short high frequency burst of activity. At the end of a blink the orbicularis oculi activity turns off and the levator palpebrae returns to its previous tonic activity [14].

Eye blink RATE DURING CONVERSATION

Eye blink rate assessments are commonplace in psychiatry and psychology related research studies especially those exploring eye blink activity in neuromotor disease and/or various psychiatry states. The response of different types of individuals to medical treatment has actually been assessed from eye blink activity studies. Sandy [15] stated that they conversational spontaneous eye blink rate assessment have been used as a reference measure by some optometric interests. Cho *et. al.* [16] said it is nonethe-

less appropriate to consider what influences might be imposed on a central processor for eye blink activity during conversation. Unquestionably, it can be argued that this is the most natural of the three measures for spontaneous eye blink activity. It is something that is common in everyday life in that humans are generally social creatures and the time averaged spontaneous eye blink rate that occurs during conversation reflects a natural homeostasis. It indeed elements of the control of spontaneous eye blink rate are determined by ocular discomfort as stated by Acosta., *et al*. [17], then it is likely that at least some of the changes in eye blink rate are those manifested during the conversational mode in day to day activities at home or work and in the relative absence of other provocative stimuli. It is also accepted that if Spontaneous eye blink rate is indeed prone to changes when an individual is aware that the eye blink is being assessed then it is likely that the changes is associated with a change in conversational mode, that is an individual becomes self-conscious and his/her conversational Interaction with another person changes as well and the eye blink rate then also changes.

Sample size

This research was carried out on a sample of hundred (100) students and workers of Abia State University, Uturu and its environs. The subjects consisted of both males and females from various departments and offices with age ranging from 18-50 years. Data was collected in the Abia State University Optometric clinic. The subjects were screened and properly examined to ensure the absence of any pathological condition that may compromise the result.

Research locale

This research was carried out in Abia State University Uturu. The optometry clinic was chosen as the reference clinic considering the availability of modern equipment in the clinic and environment as well as its proximity to the students who served as the research subjects.

Research population

The study populations are the students and workers of Abia State University Uturu coupled with some elderly people from outside the school environment of ages ranging from 18 to 50 years. People who volunteered and passed the screening exercise were used. The population consists of 100 volunteers with equal representation of both sexes.

Research materials and equipment

- Pen Light.
- 1.5 grams of Nescafe coffee containing 100% coffee.
- Stop watch.
- Distilled water (room temperature).
- 50 milliliter glass cup.
- Weighing scale.

Research criteria

In order to ascertain the suitability of subjects for this research, volunteer subjects were screened through case history, external ocular examination and internal ocular examination;

- **Pen light Examination:** A thorough inspection of the eyes and its adnexa was conducted with a pen touch and the general appearance, size, shape and colour of the eyes was noted. The size of the palpebral fissure was noted to ensure that the subject has a complete blink. The lower and upper lids were everted and inspected for follicles, ulcers, swelling, ptosis and papillae. The iris was inspected for colour, size and light reaction. Pen touch was used to screen out those that had abnormalities of the lids such as blepharitis and disease of the sclera, cornea and conjunctivitis.
- **Case History Examination:** This was used to obtain the bio data of subjects such as age, birth history and ocular health history, and family ocular health history. The present health status and nature of current illness of the subjects were ascertained. The above information was used to screen out subjects who are habitual coffee drinkers, smokers, and habitual users of steroids, stimulants and analgesics. It was also used to screen out those on medication. Those who have underlying pathology and systematic diseases were precluded.

Data collection procedure

The subjects were allowed to rest for 5 minutes and then conversed for 1 minutes during which the subjects talked with the researcher about his/her favourite hobby. The number of blinks for a minute was noted and recorded.

After which the subjects were given 1.5grams of Nescafe coffee, each, which was diluted with 50 ml of water under room temperature. Subjects drank it comfortably and the exact time of coffee intake noted. 15 minutes after the intake Nescafe coffee the number of blinks for a minute was taken. This was repeated at 30, 45 and 60, minutes at room temperature. Care was taken to avoid making the subject aware of what the researcher intended i.e. the subject was not told that his/her blink rate was obtained. Subjects were encouraged to drink the coffee at a time, without breaking the period of drink to ensure even absorption.

Data analysis technique

All statistical analysis was done using Statistical Package for Social Scientist (SPSS) version 25 at 95% confident. A repeated measure of analysis of variance (rANOVA) was used to check for significant difference in blink rates before and after intake of caffeine. Individual samples t-test was used to compare blink rate (before and after) between the males and females.

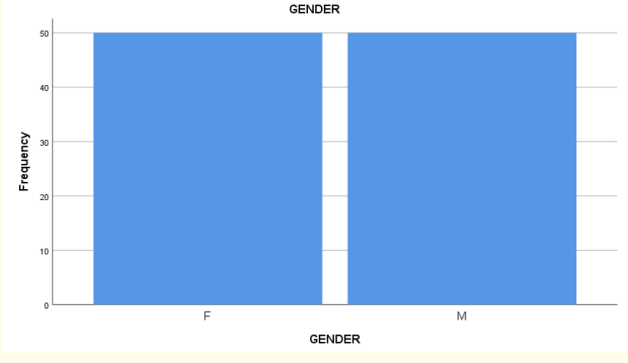
Table 1 shows the total mean of the male and female subjects before and after caffeine intake with their mean differences.

Result and analysis of data

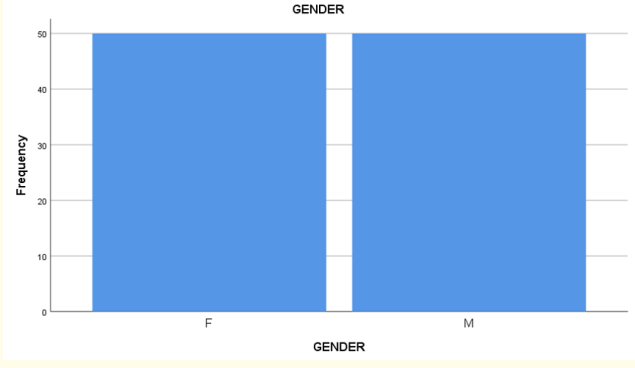
The result of this research work on the effect of caffeine on blink rates of adults during conversation is represented below. The raw data collected and graphs are shown in the appendices.

Gender	Mean Blink rate					
	Before intake	15 Mins After	30 Mins After	45 Mins After	60 Mins After	TOTAL
Male	16	13.62	12.1	10.26	14.84	66.82
Female	16.34	14.38	13.68	11.8	14.84	71.04
Mean Difference	-0.34	-0.76	-1.58	-1.54	0	-4.22

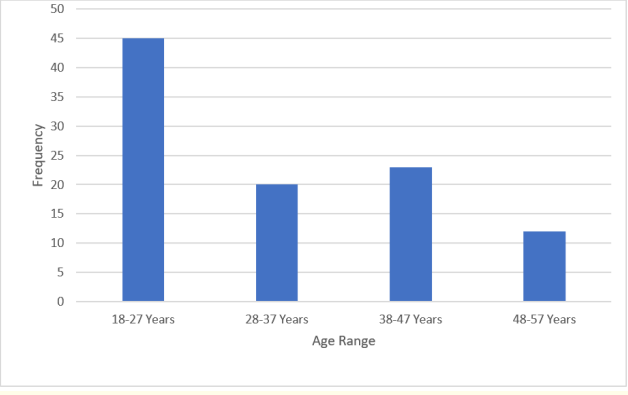
Table 1: Summary of the Mean Blink Rates between Male and Female.

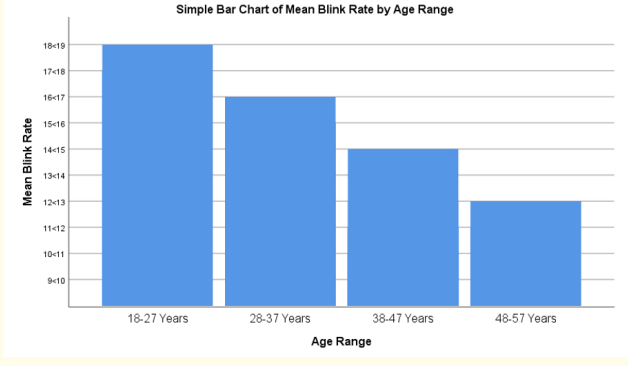


Appendix I: Figure 1: A Bar Chart Showing the Gender Distribution of the Sample.



Appendix II: Figure 2: A bar chart showing the age ranges and their respective frequencies.





Appendix III: Figure 3: Simple bar chat of mean rate by age range.

Gender	Age	Before intake	Caffeine intake				Mean
			15 mins	30 mins	45 mins	60 mins	
M	18	19	16	17	14	17	16.6
M	18	17	15	14	11	15	14.4
M	18	21	18	16	16	18	17.8
M	19	18	15	16	13	16	15.6
M	19	20	17	16	13	19	17
M	20	19	17	15	16	19	17.2
M	20	19	16	17	14	18	16.8
M	21	18	15	14	11	17	15
M	21	16	14	15	13	16	14.8
M	21	19	17	15	14	17	16.4
M	22	16	14	12	10	17	13.8
M	22	18	15	13	10	19	15
M	22	17	17	14	13	16	15.4
M	22	19	17	14	11	18	15.8
M	23	16	15	16	13	17	15.4
M	23	16	14	12	9	14	13
M	23	15	12	11	10	13	12.2
M	24	18	14	15	12	16	15
M	24	17	15	16	13	14	15
M	25	17	16	14	12	16	15
M	26	18	15	14	17	18	16.4
M	27	17	16	14	12	18	15.4
M	28	16	14	11	13	15	13.8
M	28	18	15	11	15	17	15.2
M	29	17	15	13	11	17	14.6
M	32	15	13	11	11	14	12.8
M	34	16	12	11	12	13	12.8
M	36	17	13	8	9	13	12
M	38	16	13	11	8	14	12.4
M	39	15	11	13	7	14	12
M	40	14	10	9	6	15	10.8
M	42	15	11	14	6	14	12
M	43	14	13	11	5	16	11.8
M	43	16	12	9	7	14	11.6
M	45	14	13	9	6	13	11
M	45	13	11	6	7	12	9.8
M	46	14	10	6	7	11	9.6
M	47	15	11	9	7	12	10.8
M	47	16	10	6	7	13	10.4

M	47	15	12	9	6	14	11.2
M	48	12	11	8	10	11	10.4
M	48	14	11	9	10	14	11.6
M	48	15	14	11	8	13	12.2
M	48	13	11	15	9	13	12.2
M	49	14	16	13	7	11	12.2
M	49	13	11	12	8	12	11.2
M	49	14	11	9	10	12	11.2
M	49	15	13	11	9	13	12.2
M	50	13	14	10	8	14	11.8
M	50	11	10	10	7	10	9.6
F	18	20	17	16	13	18	16.8
F	18	21	18	16	16	18	17.8
F	19	19	16	17	14	17	16.6
F	19	21	18	16	16	18	17.8
F	19	20	17	16	13	17	16.6
F	20	19	17	15	16	16	16.6
F	20	19	16	17	14	15	16.2
F	20	18	15	14	11	17	15
F	21	19	17	15	14	18	16.6
F	21	17	17	14	13	16	15.4
F	22	16	15	16	13	13	14.6
F	22	19	17	15	16	17	16.8
F	23	17	15	13	11	16	14.4
F	23	18	16	15	13	16	15.6
F	24	18	15	11	14	17	15
F	24	19	17	15	18	16	17
F	25	20	17	19	15	19	18
F	25	21	17	19	14	20	18.2
F	26	21	16	18	14	19	17.6
F	26	16	18	15	13	15	15.4
F	27	19	16	18	14	18	17
F	27	18	14	13	14	18	15.4
F	27	16	15	16	15	16	15.6
F	28	17	16	13	15	17	15.6
F	28	16	15	17	14	15	15.4
F	28	15	17	15	12	14	14.6
F	29	16	16	14	15	14	15
F	30	15	15	16	12	13	14.2
F	30	18	14	12	15	17	15.2
F	31	17	14	15	12	17	15

F	33	14	13	14	11	11	12.6
F	33	12	11	12	8	12	11
F	34	15	13	14	11	12	13
F	35	16	12	13	12	13	13.2
F	36	15	12	14	11	14	13.2
F	37	14	16	12	7	14	12.6
F	37	15	13	11	8	11	11.6
F	38	16	14	11	9	15	13
F	39	17	14	15	11	16	14.6
F	40	16	13	11	7	16	12.6
F	41	14	11	9	10	13	11.4
F	41	13	10	11	6	12	10.4
F	42	12	11	10	5	11	9.8
F	42	13	11	10	8	12	10.8
F	43	14	10	10	6	11	10.2
F	44	11	12	9	7	10	9.8
F	45	15	10	11	8	11	11
F	47	11	12	9	9	13	10.8
F	50	9	9	8	10	9	9
F	50	10	9	9	7	9	8.8

Appendix IV: Raw Data of Subjects Showing the Number of Blinks before Intake of Caffeine and After Intake of Caffeine.

Test of hypotheses

To test for significant differences in the mean blink rates, the t-test was used to compare means between the pairs (Pair 1 = before intake and 15 mins after intake, Pair 2 = before intake and 30 mins after intake, Pair 3 = before intake and 45 mins after intake, Pair 4 = before intake and 60 mins after intake). The test was done using the Statistical Package for Social Sciences (SPSS) version 25 at 95% confidence and the results are shown below T-Test.

Statistical analysis of significance

T-Test was used to test for the hypothesis and the study was done at 0.05 levels or significance. The researcher chose to analyze the data straight from the raw data i.e. ungrouped data method; the change begins at 15 minutes.

Research question

Does caffeine have any effect on blink rate of young adults?

Research hypothesis 1

- H_0: There is no significant difference in blink rate between before intake and 15 minutes after intake of caffeine.
- H_1: There is a significant difference in blink rate between before intake and 15 minutes after intake of caffeine.
- Decision Rule: Reject H_0 *iff* p-value < 0.05.

Conclusion

Since p-value < 0.05,

i.e., 0.00 < 0.05,

Reject H_0 and conclude that there is a significant difference in blink rate between before intake and 15 minutes after intake of caffeine at $\alpha = 0.05$.

Hypothesis 2

- H_0: There is no significant difference in blink rate between before intake and 30 minutes after intake of caffeine.
- H_1: There is a significant difference in blink rate between before intake and 30 minutes after intake of caffeine.
- Decision Rule: Reject H_0 *iff* p-value < 0.05.

Conclusion

Since p-value < 0.05,

i.e., 0.00 < 0.05,

Reject H_0 and conclude that there is a significant difference in blink rate between before intake and 30 mins after intake of caffeine at α = 0.05.

Hypothesis 3

- H_0: There is no significant difference in blink rate between before intake and 45 mins after intake of caffeine.
- H_1: There is a significant difference in blink rate between before intake and 45 mins after intake of caffeine.
- Decision Rule: Reject H_0 *iff* p-value < 0.05.

Conclusion

Since p-value < 0.05,

Ie, 0.00 < 0.05,

Reject H_0 and conclude that there is a significant difference in blink rate between before intake and 45 mins after intake of caffeine at α = 0.05.

Hypothesis 4

H_0: There is no significant difference in blink rate between before intake and 60 mins after intake of caffeine.

H_1: There is a significant difference in blink rate between before intake and 60 mins after intake of caffeine.

Decision Rule: Reject H_0 *iff* p-value < 0.05

Conclusion

Since p-value < 0.05,

I.e., 0.00 < 0.05,

Reject H_0 and conclude that there is a significant difference in blink rate between before intake and 60 mins after intake of caffeine at α = 0.05.

Table 2 shows the cumulative percent of the male and female subjects.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	50	50.0	50.0	50.0
	M	50	50.0	50.0	100.0
	Total	100	100.0	100.0	

Table 2: Gender analysis.

Conclusion

The effect of caffeine is not gender related.

Statistics		
Age Range		
N	Valid	100
	Missing	0
Mean		2.0200
Std. Error of Mean		0.10823
Std. Deviation		1.08227
Variance		1.171
Range		39
Minimum		18
Maximum		57

Table 3: Descriptive Statistics of the sample with respect to their age limits.

Table 3 shows Descriptive Statistics of the Sample With Respect To Their Age Limits.

Test of independence

Crosstabs

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age Range * GENDER	100	100.0%	0	0.0%	100	100.0%

Table 4: Case Processing Summary.

Research question

Is the effect of caffeine age related?

			Gender		Total
			F	M	
Age Range	18-27 Years	Count	24	21	45
		% within GENDER	48.0%	42.0%	45.0%
	28-37 Years	Count	14	6	20
		% within GENDER	28.0%	12.0%	20.0%
	38-47 Years	Count	11	12	23
		% within GENDER	22.0%	24.0%	23.0%
	48-57 Years	Count	1	11	12
		% within GENDER	2.0%	22.0%	12.0%
Total		Count	50	50	100
% within GENDER		100.0%	100.0%	100.0%	

Table 5: Age Range * Gender Cross tabulation.

Conclusion

There is a decrease in blink rate with an increase in age, before and after intake of caffeine.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before intake	16.17	100	2.602	.260
	15 mins after	14.00	100	2.437	.244
Pair 2	Before intake	16.17	100	2.602	.260
	30 mins after	12.89	100	2.995	.299
Pair 3	Before intake	16.17	100	2.602	.260
	45 mins after	11.03	100	3.205	.320
Pair 4	Before intake	16.17	100	2.602	.260
	60 mins after	14.84	100	2.589	.259

Table 6: Paired Samples Statistics.

		N	Correlation	Sig.
Pair 1	Before intake and 15 mins after	100	.808	.000
Pair 2	Before intake and 30 mins after	100	.712	.000
Pair 3	Before intake and 45 mins after	100	.743	.000
Pair 4	Before intake and 60 mins after	100	.874	.000

Table 7: Paired Samples Correlations.

The above table shows that there is a strong positive relationship between the pairs.

Discussion of Findings

The test results showed that blink rates after the intake of caffeine, decreased with time. From table 4.1, the mean baseline was 16.17 and mean blink rates post consumption of caffeine was 14.00, 12.89, 11.03 and 14.84, for 15, 30, 45 and 60 minutes respectively taken.

The results were confirmed using the T-test. Statistical method of analysis and all hypotheses were tested at 0.05 level of significance. The changes however were observed to be reversible starting from 60mins of post consumption while the peak effect was observed 15 minutes post consumption of caffeine. This is because caffeine's effect on the body starts at about 15 minutes post consumption [10].

15 minutes post consumption of caffeine decreased mean baseline of 16.17 to a mean of 14.00 blink/min by 35°%. 30 minutes post consumption of caffeine decreased by 29.37% from a baseline of 16.17to mean of 12.89. 45 minutes post consumption of caffeine decreased by 15.61% from mean baseline of 16.17to mean of 11.03. 60 minutes post consumption of caffeine decreased by 9.56% from mean baseline of 16.17 to mean of 14.84.

These findings agree with the results obtained by Ajayi., *et al.* [18] on the effect of caffeine on blink rate where he got a total mean blink rate of 16.80 blinks/min on 120 subjects used. The post caffeine intake blink measurement was taking at 30, 60 and 90 minutes after ingestion of caffeine by two groups of subjects namely the experiment and control groups. The results showed a significant decrease on blink rates of the subjects.

The findings of the study also agree with that obtained by Avasor., *et al.* [19] on the effect of consumption of regular caffeinated coffee between young adults of 18 to 35 years and older subjects of 45 to 60 years. His study concluded that older subjects tend to blink less than younger subjects.

The total mean blink rate for pre consumption of caffeine was 16.17 blinks/min. This finding differs from the study by Bentivoglio., *et al.* [20] on the analysis of blink rate patterns in normal subjects where he computed the mean blink rate during conversation as 26 blinks/min. This may be because of the wide age variation which he used, the study was conducted using 140 subjects (70 male and 70 female) ranging from 5 to 87 years. But Valeri, [21] stated that mean blink rate of young adults is 24.93 blinks/min and 25.13 blinks/min respectively hence supporting the researcher's findings. According to this research work, there is no difference in blink rates of young males and females. This supports the finding of Robert [22], Valeri [21], and Bentivoglio [20].

According to this research work, there is a decreased blink in older subjects before and after intake of caffeine. Reduced sensitivity in the elderly contributes to this effect. This was not noted in the previous work done by Bentivoglio., *et al.* [20].

Finally, this research work shows that the effect of caffeine tends to elapse from one hour. The result of blink rate after 60 minutes of intake of caffeine from the raw data proves similar to the blink rate before intake of caffeine.

After drinking a hot cup of caffeinated coffee, the caffeine causes three different chemical reactions that boost our energy levels:

- It energizes us by pumping hormone adrenaline into our system.
- It blocks the connection of adenosine to nerve cells, therefore reducing blood to the muscles (including those of levator palpebrae superioris muscle and orbicularis oculi muscle), used for blinking, skin and inner organs. Adenosine is the chemical that attaches to the receptors in the brain and causes drowsiness by slowing nerve cells activity example in this case.
- It increases dopamine levels within our bodies. Dopamine is a neurotransmitter that stimulates our "pleasure areas" in the brain making one feel good. Cooper., *et al*. [23] noted that this increase in dopamine levels is accomplished by over stimulating the receptor on the post synaptic neuron either by increasing the amount of dopamine through excessive presynaptic release or by inhibiting dopamine reuptake or chemical breakdown. Stimulants such as cocaine and methamphetamine increase the amount of available dopamine in the brain which leads to mood elevation (e.g. feelings of elevation or euphoria) and increased motor activity, but with cocaine, the effects arc short lived compared to that of methamphetamine says Thomas., *et al*. caffeine being a stimulant is expected to have a similar effect.

Inclusion Criteria

- All subjects were in good health during the time of this study.
- Subjects did not present with any form of ocular surface disease.
- All subjects had normal ocular functioning.

Exclusion criteria

- Individuals who use hallucinogenic drugs were precluded from this study.
- Subjects did not have any foreign body in their ocular surface as this may affect blink rate.
- Subjects who were on topical eye medication did not take part in this study.
- Individuals with allergic conjunctivitis

Conclusion

In conclusion the results of the study showed that;

- Caffeine decreased blink rates of adults during conversation.
- There is no significant difference of the effect of caffeine in the mean blink rates of males and female adults.
- There is a significant difference of the effect of caffeine in the mean blink rates of old and young adults. Older subjects tend to have decreased blink rate than younger subjects.
- The effect of caffeine tends to elapse from one hour.

Contribution to Knowledge

The study added to the existing literature review will guide the health care practitioners in the management of dry eye symptoms. The work will also serve as a guide in advising patients especially older patients on the intake of caffeine and its effects.

Suggestions for Further Studies

Further studies should be carried out to;

- Determine the effect of caffeine on patients with high BP and IOP
- Determine the effect of other type of tea like the green and oolong tea on blink rate and IOP.
- Determine the effect of other types of teas on hypertensive patients
- Further research on black caffeine should address hypertension by systolic and diastolic.
- The dominant eye should be considered during further research.

Recommendations

- Moderate amounts of caffeine should be taken since caffeine intake decreases blink rate which invariably interferes with proper functioning of the eye.
- Further study should be carried out on blink rates of people below 18years and above 50 years of age.
- More awareness should be created in the therapeutic uses of caffeine such as management of asthma, headache, muscle fatigue and hyper kinematic children.

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