Effect of Caffeine on Contrast Sensitivity among Young Adults of Abia State University

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Authors’ contributions

This work was carried out in collaboration among all authors. Authors APO and UAU conceived the study, conducted data analyses, wrote the manuscript and interpreted the findings. Authors AOP and CGI discussed and reviewed results wrote conclusions. All authors participated in scientific content, discussion and review of the manuscript. Author CGI participated in manuscript conceptualization and review. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Caffeine is the most widely consumed psychoactive substance. Unlike many other psychoactive substances, it is legal and unregulated in the world. Several experts suggest that moderate use of caffeine (300 mg or equivalent to 3 cups or less to regular size cups of coffee per day) is safe and so not likely to cause health issues. Intake of caffeine has been suggested to affect the visual system. This study examined the effect of consumption of caffeine on contrast sensitivity of the eye among young adults of Abia State University students within the age range of 17-30 yrs.

Methods: This study employed a cross-sectional design and was carried out within the confinement of Abia State University Eye Clinic. A total of 100 young adults consisting of an equal number of males and females were measured using the Rabin’s contrast sensitivity at baseline, 30 mins until 120 mins. One way analysis of variance (ANOVA) and the Chi-square statistical analysis was used to analyze statistically the research hypotheses at 95% level of significance.

Results: The findings of this study reveal that mean contrast sensitivity values for 16 to less than 20 years old were 1.70 at baseline and increased to 1.79, 1.89, 1.93 except at 120 minutes post-
ingestion of caffeine. In males and females, contrast sensitivity increased by 1.57%, 3.7%, 5.3% and 10.7%, 20.7% 23.3% respectively. At 95% confidence level, caffeine ingestion had a significant effect on contrast sensitivity for both males (4.79) and females (5.8).

**Conclusion:** This study depicts that the ingestion of caffeine affects or increases contrast sensitivity in both males and females although this effect is short-lived.

**Keywords:** Caffeine; Contrast sensitivity.

1. **INTRODUCTION**

Caffeine is the world’s most consumed psychoactive substance. Unlike many other psychoactive substances, it is legal and unregulated in nearly all parts of the world [1]. Beverages containing caffeine such as coffee, which is the primary source of caffeine tea, soft drinks, and energy drinks, enjoy great popularity. It is also available as a stimulant in the form of a tablet [2]. Caffeine is a central nervous stimulant having the effect of temporarily warding off drowsiness and restoring alertness; it induces increased wakefulness, increased focus, and better general body coordination [2]. Caffeine at low doses helps alertness and performance while moderate doses have no long-term risk except increased osteoporosis. At higher doses, caffeine causes agitation, insomnia, and restlessness [3]. Soft drinks typically contain 10-50 mg of caffeine per serving. Majority of experts suggest that moderate use of caffeine (300mg or equivalent to 3 cups or less to regular size cups of coffee per day) is safe and so not likely to cause health issues [3]. When 10 g of caffeine is taken, it is considered a lethal dose.

The effect of caffeine begins at about 15 minutes after consumption and lasts up to 8-14 hours after the substances are excreted from the body through urine. Caffeine from coffee or other beverages is absorbed by the small intestine within 45 minutes of ingestion and distributed throughout the bodily tissues [4]. Peak plasma concentration occurs between 15 and 120 minutes after oral ingestion. This wide discrepancy in time is a result of variation in gastric emptying time and the presence of other dietary constituents such as fibers [5]. The half-life of caffeine (that is the time required for the body to eliminate one half of the total amount of caffeine consumed at a given time) differs among individuals due to several factors such as age, genetic factors, lifestyle, contraceptives, smoking, pregnancy, and level of enzymes in the tissue needed for the metabolism of caffeine. Caffeine has a molecular formula of C_{6}H_{10}N_{4}O_{2} and a molecular structure (see below).

Caffeine is a bitter-tasting white odorless powder with a melting point of 235-238 and sublimes at 178°C. Caffeine is moderately soluble in boiling water (66 g/100 ml) [6] It is moderately soluble in ethanol (1.5 g/100 ml) and also a weakly basic (PKa-0.6) requiring a strong acid to protonate [7]. Caffeine does not contain stereogenic centers [8] and hence classified as an achiral molecule. The ability to measure acuity is very important clinically and affects diagnostic and management decisions. However, measuring an individual’s ability to detect minor changes in luminance is also important and often referred to as contrast sensitivity. Contrast sensitivity refers to the ability of the visual system to distinguish between an object and its background [9]. Contrast sensitivity can provide an evaluation of the detection of objects of varying spatial frequencies [10]. Contrast sensitivity is the capability of detecting very early dysfunction even when Snellen visual acuity is normal [11]. This assessment of contrast increases our understanding of how individuals perceive the world as it provides a more complete detailed assessment of the visual function related to a real visual environment [12]. Contrast sensitivity measurement contributes additional information to that provided by visual acuity alone becoming the most single means of evaluating the visual system responding to information particularly to patients with visual impairment [13].

2. **MATERIALS AND METHODS**

This study was carried out in the Optometry clinic of Abia State University Uturu. This clinic was selected because of its proximity and accessibility to the subjects involved in this study as the majority of the subjects were students. 100 subjects between the ages of 17 – 30 years...
were selected randomly. Fifty subjects each of both sexes (50 males and 50 females). This age range was used because they have relatively healthy eyes and are the most coffee users. Subjects who were found to have refractive errors greater than +/- 0.25 were excluded from this study.

- Subjects whose visual acuity improved through pinhole acuity were excluded from this study.
- Subjects who through case history were found to be habitual coffee drinkers were excluded from this study.
- Subjects who were found out to have systemic diseases were excluded from this study.
- Subjects who were found to be habitual smokers and users of steroids, oral contraceptives, analgesics, and other simulants were excluded.
- Subjects who did not fall within the specified age range were excluded from this study.

2.1 Screening Procedure

- Thorough case histories of the subjects were taken with emphasis on drug history and systemic diseases to help rule out subjects who could affect the test result in this study.
- Visual acuity measurement at far and at near was taken to determine the resolving power of the eye.
- Visual acuity measurement was carried out as well using a pinhole.
- An external eye examination with a penlight was performed to observe the outer ocular structures to rule out any obvious pathology.
- Retinoscopy was performed to determine the refractive status of the subjects so as rule out subjects with refractive error using the phoropter.
- Ophthalmoscopy was performed to check for the presence of any underlying pathology and ocular health status of the subject.

2.2 Research Design

The study was designed to be a clinic-based study in which the volunteers were first screened for any ocular abnormalities and systemic diseases that may affect the test results. Also, a thorough drug history was carried out during the case history. Before the start of this study, each subject’s baseline contrast sensitivity values were obtained, recorded and used as a control, then 2 grams of caffeine dissolved in 160ml was taken by each subject after whom the result was obtained by taking the contrast sensitivity of each subject at 30, 60, 90 and 120minutes post caffeine ingestion.

2.3 Research Instrument/Materials

The following instruments/materials were used for this research;

- Snellen’s visual acuity chart at 6 m(20 ft) for visual acuity measurement at far
- Rayner’s near chart at 40 cm for visual acuity measurement at near
- Penlight for external examination
- Coffee(nestle)
- Rabin’s contrast sensitivity chart
- Graduated measuring cup
- Teaspoon
- Retinoscope
- Direct Ophthalmoscope-Heine(BETA-200)

2.4 Measurement of Visual Acuity (VA)

In measuring the VA at far, Snellen’s visual acuity chart at distance was used. This visual acuity was measured one eye at a time and then binocularly with the aid of an occluder to cover the eye not being tested and then with the optotype chart. The Snellen acuity chart was placed at 6 meters and the occluder was placed in front of the eye not being tested. The subject was instructed to read out aloud from the top-most letters to the best VA line. The subject continues to read the letter of the optotype being presented until the last letter that cannot be read.

At near the subject reads Rayner’s near vision test card at 40 cm using the same procedure at far.

2.5 Measurement of Refractive Status Using Retinoscope

In determining the refractive status of the subjects, the retinoscope was used. Subjects were seated comfortably behind the phoropter. The illumination of the room was dim with the subject fixating at the largest optotype on the Snellen chart at 6 meters. Accommodation was relaxed by placing the lens equivalent of the working distance and the eye was scoped at different meridian to identify any movement. Movement was neutralized using lenses, with the lens that completely neutralizes the retinoscopic reflex seen as the refractive status of the subject.
2.6 Measurement of Contrast Sensitivity

The contrast sensitivity measurement was carried out by the use of Rabin’s contrast sensitivity chart at 4 meters. The eyes were tested independently and the eye not under test occluded. The Rabin’s contrast sensitivity chart at 4 meters (13 ft) has 20/50 letter size, 8 rows with contrast sensitivity decreasing 0.25 log steps per row having 5 letters per row, and 0.005 logs per letter (0.025). According to the manufacturers, the test is to be administered with the best optical correction at a distance of 4 meters having the room light off and illumination box on. One eye is occluded and the subject is instructed to begin a row at 1 and read each letter aloud.

2.7 Data Collection and Analysis

A total of 100 participants comprising of 50 males and 50 females were included in this study. The research was conducted in the following manner:

One teaspoonful of caffeinated coffee (2 grams) was dissolved in 160 ml of water and each was administered on subjects between 17-30 years of age. Before the commencement of the study, each subject’s baseline contrast sensitivity values were measured to serve as a control. Thereafter one cup of coffee (160 ml) was administered to the subject and the contrast sensitivity acuity was taken. This procedure was repeated three more times with the same time interval. The data collected were analyzed and tabulated using the one-way analysis of variance (ANOVA) and the Chi-square statistical method at 95% level of significance.

3. RESULTS, ANALYSES AND INTERPRETATION OF DATA

In Table 1, the baseline contrasts sensitivity value in the age range of 16–<20 was 1.70, at 30 minutes it increased to 1.79 with a percentage increase of 5.3%, at 60 minutes it increased to 1.89 with a percentage increase of 11.2%, at 90 minutes it increased to 1.93 with a percentage increase of 13.5%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.80 and this represents a percentage decrease of 5.8%. In 20–<24, the baseline contrast sensitivity was 1.64, at 30 minutes it increased to 1.86 with a percentage increase of 13.4%, at 60 minutes it increased to 1.91 with a percentage increase of 16.5%, at 90 minutes it increased to 1.94 with a percentage increase of 18.3%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.78 and this represents a percentage decrease of 8.5%. In the age range of 24–<28, the baseline contrast sensitivity was 1.70 at 30 minutes it increased to 1.84 with a percentage increase of 8.0%, at 60 minutes it increased to 1.90 with a percentage increase of 11.8%, at 90 minutes it increased to 1.98 with a percentage increase of 16.5%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.78 and this represents a percentage decrease of 2.4%. In the age range of 28–<32, the baseline contrast sensitivity value was 1.74, at 30 minutes it increased to 1.87 with a percentage increase of 7.5%, at 60 minutes it increased to 1.94 with a percentage increase of 11.5%, at 90 minutes it increased to 1.97 with a percentage increase of 13.2%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.79 and this represents a percentage decrease of 2.9%.

3.1 Hypothesis

- Null hypothesis (H₀): Caffeine intake has no significant effect on contrast sensitivity
- Alternative hypothesis (H₁): Caffeine intake has a significant effect on contrast sensitivity.
- Decision Rule: Reject H₀ if and only if Fcalc is greater than Ftab otherwise accept H₀. Where Ftab is 3.06. Since Fcalc (36.55) is greater than Ftab (3.06), we reject H₀ and conclude that caffeine intake have a significant effect on contrast sensitivity.

| Table 1. Mean contrast sensitivity values before and after caffeine ingestion of both males and females (n=100) |
|---|---|---|---|---|---|
| Age (yrs.) | Baseline | After 30 mins | After 60 mins | After 90 mins | After 120 mins |
| 16<20 | 1.70 | 1.79 (5.3) | 1.89 (11.2) | 1.93 (13.5) | 1.80 (5.8) |
| 20<24 | 1.64 | 1.86 (13.4) | 1.91 (16.5) | 1.94 (18.3) | 1.78 (8.5) |
| 24<28 | 1.70 | 1.80 (8.0) | 1.90 (11.8) | 1.98 (16.5) | 1.74 (2.4) |
| 28<32 | 1.74 | 1.87 (7.5) | 1.94 (11.5) | 1.97 (13.2) | 1.79 (2.8) |
3.2 Hypothesis

- Null hypothesis (H₀): Caffeine ingestion in males have no significant effect on contrast sensitivity
- Alternative hypothesis (H₁): Caffeine ingestion in males have a significant effect on contrast sensitivity

Table 2. Mean contrast sensitivity values of males before and after caffeine ingestion (n=100)

<table>
<thead>
<tr>
<th>Age (yrs.)</th>
<th>Baseline</th>
<th>After 30mins</th>
<th>After 60mins</th>
<th>After 90mins</th>
<th>After 120mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>16–&lt;20</td>
<td>1.90</td>
<td>1.93 (1.6)</td>
<td>1.97 (3.7)</td>
<td>2.00 (5.3)</td>
<td>1.93 (1.6)</td>
</tr>
<tr>
<td>20–&lt;24</td>
<td>1.68</td>
<td>1.90 (13.1)</td>
<td>1.92 (14.3)</td>
<td>1.94 (15.5)</td>
<td>1.79 (6.6)</td>
</tr>
<tr>
<td>24–&lt;28</td>
<td>1.62</td>
<td>1.81 (11.7)</td>
<td>1.87 (15.4)</td>
<td>2.00 (23.5)</td>
<td>1.76 (8.6)</td>
</tr>
<tr>
<td>28–&lt;32</td>
<td>1.78</td>
<td>1.85 (3.9)</td>
<td>1.95 (9.6)</td>
<td>1.97 (10.7)</td>
<td>1.84 (3.4)</td>
</tr>
</tbody>
</table>

In Table 2, the baseline contrast sensitivity value in the age range of 16–<20 was 1.90, at 30 minutes it increased to 1.93 with a percentage increase of 1.6%, at 60 minutes it increased to 1.97 with a percentage increase of 3.7%, at 90 minutes it increased to 2.00 with a percentage increase of 5.3%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.93 and this represents a percentage decrease of 1.6%. In 20–<24, the baseline contrast sensitivity was 1.68, at 30 minutes it increased to 1.90 with a percentage increase of 13.1%, at 60 minutes it increased to 1.92 with a percentage increase of 14.3%, at 90 minutes it increased to 1.94 with a percentage increase of 15.5%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.79 and this represents a percentage decrease of 6.6%. In the age range of 24–<28, the baseline contrast sensitivity was 1.62, at 30 minutes it increased to 1.81 with a percentage increase of 11.7%, at 60 minutes it increased to 1.87 with a percentage increase of 15.4%, at 90 minutes it increased to 2.00 with a percentage increase of 23.5%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.76 and this represents a percentage decrease of 8.6%. In the age range of 28–<32, the baseline contrast sensitivity value was 1.78, at 30 minutes it increased to 1.85 with a percentage increase of 3.9%, at 60 minutes it increased to 1.95 with a percentage increase of 9.6%, at 90 minutes it increased to 1.97 with a percentage increase of 10.7%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.84 and this represents a percentage decrease of 3.4%.

Decision Rule: Reject H₀ if and only if Fcal is greater than Ftab, otherwise accept H₀. Where Ftab is 3.06. Since Fcal (4.79) is greater than Ftab (3.06), we reject H₀ and conclude that caffeine intake in males have a significant effect on contrast sensitivity.

In Table 3, the baseline contrast sensitivity value in the age range of 16–<20 was 1.50, at 30 minutes it increased to 1.66 with a percentage increase of 10.7%, at 60 minutes it increased to 1.81 with a percentage increase of 20.6%, at 90 minutes it increased to 1.85 with a percentage increase of 23.4%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.67 and this represents a percentage decrease of 11.3%. In 20–<24, the baseline contrast sensitivity was 1.60 at 30 minutes it increased to 1.82 with a percentage increase of 13.7%, at 60 minutes it increased to 1.90 with a percentage increase of 18.7%, at 90 minutes it increased to 1.93 with a percentage increase of 20.6%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.77 and this represents a percentage decrease of 10.6%. In the age range of 24–<28, the baseline contrast sensitivity was 1.78 at 30 minutes it increased to 1.86 with a percentage increase of 4.5%, at 60 minutes it increased to 1.94 with a percentage increase of 8.9%, at 90 minutes it increased to 1.95 with a percentage increase of 9.6%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.82 and this represents a percentage decrease of 2.3%. In the age range of 28–<32, the baseline contrast sensitivity value was 1.70, at 30 minutes it increased to 1.88 with a percentage increase of 10.8%, at 60 minutes it increased to 1.93 with a percentage increase of 13.5%, at 90 minutes it increased to 1.96 with a percentage increase of 15.3%. However, at 120 minutes the mean contrast sensitivity value decreased to 1.74 and this represents a percentage decrease of 2.4%.

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Table 3. Mean contrast sensitivity values of females before and after caffeine ingestion (n=100)

<table>
<thead>
<tr>
<th>Age (yrs.)</th>
<th>Baseline</th>
<th>After 30mins</th>
<th>After 60mins</th>
<th>After 90mins</th>
<th>After 120mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-&lt;20</td>
<td>1.50</td>
<td>1.66 (10.7)</td>
<td>1.81 (20.6)</td>
<td>1.85 (23.4)</td>
<td>1.67 (11.3)</td>
</tr>
<tr>
<td>20-&lt;24</td>
<td>1.60</td>
<td>1.82 (13.7)</td>
<td>1.90 (18.7)</td>
<td>1.93 (20.6)</td>
<td>1.77 (10.6)</td>
</tr>
<tr>
<td>24-&lt;28</td>
<td>1.78</td>
<td>1.85 (4.5)</td>
<td>1.94 (8.9)</td>
<td>1.95 (9.6)</td>
<td>1.82 (2.3)</td>
</tr>
<tr>
<td>28-&lt;32</td>
<td>1.70</td>
<td>1.88 (10.6)</td>
<td>1.93 (13.5)</td>
<td>1.96 (15.3)</td>
<td>1.74 (2.4)</td>
</tr>
</tbody>
</table>

3.3 Hypothesis

- Null hypothesis (H₀): Caffeine ingestion in females have no significant effect on contrast sensitivity
- Alternative hypothesis (H₁): Caffeine ingestion in females have a significant effect on contrast sensitivity

Decision Rule: Reject H₀ if and only if F_cal is greater than F_tab, otherwise accept H₀. Where F_tab is 3.06. Since F_cal (5.82) is greater than F_tab (3.06), we reject H₀ and conclude that caffeine intake have a significant effect on contrast sensitivity.

Table 4. Contrast sensitivity differences of right and left eye with age (n=100)

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Contrast sensitivity difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-&lt;20</td>
<td>0.05</td>
</tr>
<tr>
<td>20-&lt;24</td>
<td>0.07</td>
</tr>
<tr>
<td>24-&lt;28</td>
<td>0.06</td>
</tr>
<tr>
<td>28-&lt;32</td>
<td>0.08</td>
</tr>
</tbody>
</table>

3.4 Hypothesis

- Null hypothesis (H₀): Effect of caffeine on contrast sensitivity is not gender dependent.
- Alternative contrast sensitivity (H₁): Effect of caffeine on contrast sensitivity is gender dependent.

\[ X^2_{cal} = 0.0344 \]
\[ X^2_{tab} = 9.49 \]

Decision rule: Accept H₀ if \( X^2_{cal} < X^2_{tab} \), if otherwise reject. Since \( X^2_{tab} \) is greater than \( X^2_{cal} \), we accept H₀ and conclude that caffeine effect on contrast sensitivity is not gender dependent.

4. DISCUSSION, CONCLUSION AND RECOMMENDATION

4.1 Discussion

In this research work, contrast sensitivity increased at different assessment times after the ingestion of 2 grams of caffeine. In Table 1, the mean contrast sensitivity baseline for subjects between the age range of 16 to < 20 was 1.70, at 30 minutes contrast sensitivity value increased to 1.79 with a percentage increase of 5.29%, at 60 minutes contrast sensitivity value increased to 1.89 with a percentage increase of 11.2% and at 90 minutes, contrast sensitivity value increased to 1.93 with a percentage increase of 13.5%. However, contrast sensitivity value decreased to 1.80 at 120 minutes and this represents a percentage decrease of 5.8%. In the age range of 20 to < 24, contrast sensitivity increased more from the baseline by 13.4%, 16.5% and 18.3% respectively. The peak increase in mean contrast sensitivity value at 90 minutes was more significant in subjects between the age ranges of 24 to < 28 yrs and conversely contrast sensitivity value receded to 1.74 in this age range.

In Table 2, the mean contrast sensitivity value in subjects between the age range of 16 to < 20 increased from the baseline, 1.90 to 1.93 at 30 minutes, 1.97 at 60 minutes, 2.00 at 90 minutes and receded to 1.93 at 120 minutes. Subjects between the age range of 16 to < 20 and 24 to < 28 yrs had a peak increase in the mean contrast sensitivity values at 90 minutes respectively. The peak increase in contrast sensitivity values in these two age range represent a percentage increase of 5.26% and 23.5% respectively. In the age range of 20 to < 24 contrast sensitivity values increased from the baseline by 13.1%, 14.3% and 5.5%.

In Table 3, the mean contrast sensitivity values in the age range of 16 to < 20 increased by 10.7%, 20.7%, 23.4% except at 120 minutes where there was a percentage decrease of 11.3%. Subjects between the age range of 28 to < 32 had a peak increase in mean contrast sensitivity values at 90 minutes and this represents a percentage increase of 15.3%.

The result of the study affirms that caffeine ingestion increased contrast sensitivity at different assessment times except at 120 minutes, where the effect of caffeine would have
started receding. The result of this study was also tested using one way of analysis of variance (ANOVA) and it was shown that statistically, caffeine ingestion has a significant effect on contrast sensitivity at a 95% confidence level.

The findings of this study in Table 2 and Table 3 revealed that contrast sensitivity increased simultaneously in both males and females with a peak increase in subjects between the age ranges of 16 to< 20, 24 to<28 and 32 to< 32 respectively. The peak significant increase in contrast sensitivity at 90 minutes could be explained by the fact that caffeine from coffee or other beverages is absorbed by small intestine within 45 minutes of ingestion and distributed throughout the tissues of the body and reaches a peak plasma concentration within 12 hours [4]. Thus ingestion of caffeine can be said to be responsible for increases in contrast sensitivity at 30, 60 and 90 minutes post-ingestion of caffeine since this increase was not found in the baseline.

Furthermore, the result of this study in Table 2 and Table 3 suggest that there was no significant difference in the mean contrast sensitivity values of both males and females. This finding was tested using the chi-square statistical method of analysis to know whether the effect of caffeine on contrast sensitivity is gender-dependent. It was found that there was no statistically significant difference in the contrast sensitivity of males and females as a result of caffeine ingestion. This finding is consistent with other research where they investigated the possibility of sex difference to spatial frequency processing by measuring the contrast sensitivity and reaction time in 20 male and 20 female undergraduates between the ages of 18-25 years [14]. No statistically significant effect was recorded suggesting that males and females process spatial frequency information similarly. The finding was also consistent with the findings of another study where it was reported that gender is not statistically significant in spatial contrast sensitivity [15]. In this instance, a one-way analysis of variance (ANOVA) revealed no significant difference in mean contrast scores at any of the spatial frequencies tested for ascending, descending, or combined threshold measurements. This study is not left without challenges. One of the major challenges encountered was that people were unwilling to participate due to the acridity of caffeine. Another limitation was that the subjects found it skeptical to reveal their real age as well as their general health status. Additionally, time constraint was another challenge experienced as some of the participants were not always available at the required time. Furthermore, since data collection was subjective, participants may not have given adequate response due to factors like psychological and mental state.

4.2 Conclusion and Recommendation

This study has shown that the ingestion of caffeine increased the contrast sensitivity of the subjects enrolled in this study. It is therefore concluded that acute ingestion of caffeine is responsible for the transient increase in contrast sensitivity. We recommend that optometrists should probe caffeine intake while taking case history since its consumption affects contrast sensitivity. This will facilitate good clinical Judgment. Prolonged use of caffeine as a treatment regimen by medical and non-medical professionals should be discouraged.

FUNDING

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AVAILABILITY OF DATA AND MATERIALS

All the required data are available in the main article document. Additionally, the data set used and analyzed during the current study is available from the corresponding author on reasonable request.

CONSENT

The subject’s informed and written consent was sought before enrolling them into the study so as not to feel compelled or obliged and to also ensure their maximum cooperation.

ETHICAL APPROVAL

As per international standard written ethical permission has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES


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